TEMS™ CellPlanner

Common Features User's Guide

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Preface

Document Conventions

This document uses the following conventions:

Bold type	Window names, button names, and keyboard keys are displayed as bold text. Example: Click **Edit.**
Menu↗Selection	Navigation in menu paths are displayed as bold text with arrows between menu levels.
`Typewriter type`	File names and literal input and output. Example: `sites.xml`
Italic type	Book titles and definitions are displayed in italic. Examples: *carrier mapping, Technical Reference Manual*
Left-click Right-click	All instructions including mouse clicks assume a mouse configured with the left mouse button as primary button.

Navigation

Use the ALT ← and ALT → buttons to navigate between link jumps in the Manuals.

Assumed Knowledge

This documentation presumes that you have good knowledge about radio network planning principles and the radio technology to plan.

Disclaimer

The parameter values in this manual are just examples to help you getting started quickly, and do not constitute any performance guarantees for the planned equipment of your final network planning.

Proper parameter values depend on the equipment version, the operator's business plan, and the operator's network deployment strategy. Recommended parameter values should be provided by the operator, the equipment vendor or your service delivery organization.

Manuals

The following PDF manuals are delivered with the TEMS CellPlanner software:

Installation Guide

EN/LZT 108 9831 R4A

Describes system requirements, how to install and configure TEMS CellPlanner components and manage licenses, and provides an overview of all TEMS CellPlanner components. The procedures must be performed by a user with administrator privileges on the local computer. Some procedures require that you are an authorized TEMS CellPlanner administrator.

Common Features User's Guide

EN/LZT 108 9832 R4A

Includes Glossary of terms used in TEMS CellPlanner, concepts about licenses, and how use projects, explorer objects used by more than one radio technology, how to add sites and use site tools, filters, plots, neighbors, AMI, tuning propagation models, ASMT (Automatic Sector Model Tuning), puncturing, export and import data, and work with projects on server. Here TEMS CellPlanner administrators find how to administer users, groups and projects on servers shared by multiple users.

Common Features Technical Reference Manual

EN/LZT 108 9833 R4A

Describes radio technology independent algorithms, parameters and file formats.

GeoData User's Guide

EN/LZT 108 9834 R4A

Describes geodata concepts, supported geodata formats, conversion between different map formats, how to use map data tools in TEMS CellPlanner. The chapters about providing and importing map data are intended for administrators of map data. Other chapters are intended for users of map data.

Map Import Wizard User's Guide

EN/LZT 108 9943 R2A

Describes how to import map data using a generic wizard similar to the one provided with TEMS LinkPlanner. The intended reader is administrator of map data.

LTE User's Guide

EN/LZT 108 9944 R3A

Describes how to use LTE functions of TEMS CellPlanner, including analysis, and creation of plots and reports.

LTE Technical Reference Manual

EN/LZT 138 0235 R2A

Describes LTE network planning principles, analysis details for advanced users, and cell ID planning principles.

WCDMA User's Guide

EN/LZT 108 9837 R4A

How to use WCDMA functions of TEMS CellPlanner, including analysis, and creation of plots and reports.

WCDMA Technical Reference Manual

EN/LZT 108 9838 R4A

Describes concepts and overviews of WCDMA algorithms, and HSPA and MBMS in TEMS CellPlanner.

GSM User's Guide

EN/LZT 108 9835 R4A

Describes how to use the GSM functions of TEMS CellPlanner, including analysis, and creation of plots and reports.

GSM Technical Reference Manual

EN/LZT 108 9836 R4A

Describes overlaid/underlaid cell structures, reuse patterns, manual frequency planning, automatic frequency planning (AFP), automatic hopping frequency set (HFS) planning, optimization of BSIC, HSN and MAIO, fractional load planning, and effective subscriber modeling. Also describes the GSM algorithms and file formats used in TEMS CellPlanner.

WiMAX User's Guide

EN/LZT 108 9839 R4A

Describes how to use the WiMAX functions of TEMS CellPlanner, including analysis, and creation of plots and reports.

1
Overview of TEMS CellPlanner

This chapter provides an overview of the TEMS CellPlanner product.

Topics **Page**

About TEMS CellPlanner 1-2
Installation 1-2
Product Packaging 1-2
Licenses 1-3
Support and FAQ 1-4

About TEMS CellPlanner

TEMS™ CellPlanner is a graphical PC-based application for designing, implementing, and optimizing mobile radio networks. It assists you in performing complex tasks, including network dimensioning, traffic planning, site configuration, frequency planning, and network optimization.

Installation

The Installation Guide describes how to install software and licenses.

Product Packaging

The product package includes the software components listed below.

What is actually installed depends on your selection in the installation wizard.

Product Components	Selecting this component installs...
• TEMS CellPlanner *named "TEMS CellPlanner Client" in the manuals*	• Radio Technology Features • Planning Features • Manuals • Map tools, geodata conversion software, demo maps, filters, scripts • Citrix software - relevant only if you are going to offer this TEMS CellPlanner installation as a Citrix service
• Enterprise Server	Enterprise Server software plus the User Administration software
• Zero Admin Server	Zero Admin Server software plus the User Administration software
• User Administration	User Administration software only
• License Server	License Server software only

Some of the components are licensed, see Licensed Components on page 1-3.

The Installation Guide provides an overview of each component and how the components relate to each other.

Licenses

The Installation Guide describes how to install licenses.
The Common Features User's Guide describes how to activate licensed features.

Licensed Components

Three of the Product Components are licensed:

TEMS CellPlanner *named "TEMS CellPlanner Client" in the manuals*	To start TEMS CellPlanner you need a license for at least one of the Radio Technology Features. Additional licenses are required for each of the Radio Technology Features and Planning Features to use.
Enterprise Server	License required to start the server
Zero Admin Server	License required to start the server

Radio Technology Features

Each of the radio technology software modules listed below require an installed and activated license. How to use the radio technology software is described in adherent user guides and technical reference manuals.

- GSM
- WCDMA
- WCDMA,HSPA
- WiMAX
- LTE

Planning Features

Additional planning features can be used together with the radio technology software. These additional software modules require a license for the feature itself and a license for the adherent radio technology:

• Automatic Cell Planning	Requires WCDMA or WCDMA,HSPA license
• Automatic Frequency Planning	Requires GSM license. This license is required also for automatic HFS planning.
• Automatic Measurement Integration and ASMT	Requires license for at least one of the Radio Technology Features ASMT = Automatic Sector Model Tuning.

Support and FAQ

For support and FAQ about TEMS CellPlanner, use the TEMS support web site:

www.ascom.com/networktesting

To provide TEMS support with information when reporting a problem, follow the instructions in chapter *Support Information* in the Installation Guide.

2
Using TEMS CellPlanner

This chapter describes how to start TEMS CellPlanner and use the graphical user interface (GUI).

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- Start TEMS CellPlanner 2-2
- Exit TEMS CellPlanner 2-2

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- Global Edit in Explorers 2-24

Map Display Actions 2-27
- Select Sites in Map Display 2-27
- Copy/Paste in Map Display 2-27

Getting Started with TEMS CellPlanner

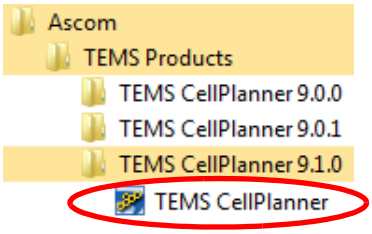
Use the procedures in this section to start and leave TEMS CellPlanner.

In some cases, especially during starting and exiting TEMS CellPlanner, the user interface might freeze. This is due to the way in which MS Windows handles network drives. It is recommended to remove unused network drives, especially if the network drive is unavailable, indicated by a red X in the Windows explorer.

Start TEMS CellPlanner

Do as follows to start TEMS CellPlanner and load a project:

1. Select **Start↗Programs↗Ascom↗TEMS Products↗**TEMS CellPlanner **<version number>↗TEMS CellPlanner** as in the example below:



   If you cannot start the program as described above, start it by double-clicking on `C:\Program Files\Ascom\TEMS Products\TEMS CellPlanner <version number>\Client\Tcp.bat`.

   To start the program in detailed logging mode, double-click on `C:\Program Files\Ascom\TEMS Products\TEMS CellPlanner <version number>\Client\Tcp_detailed_log.bat`.

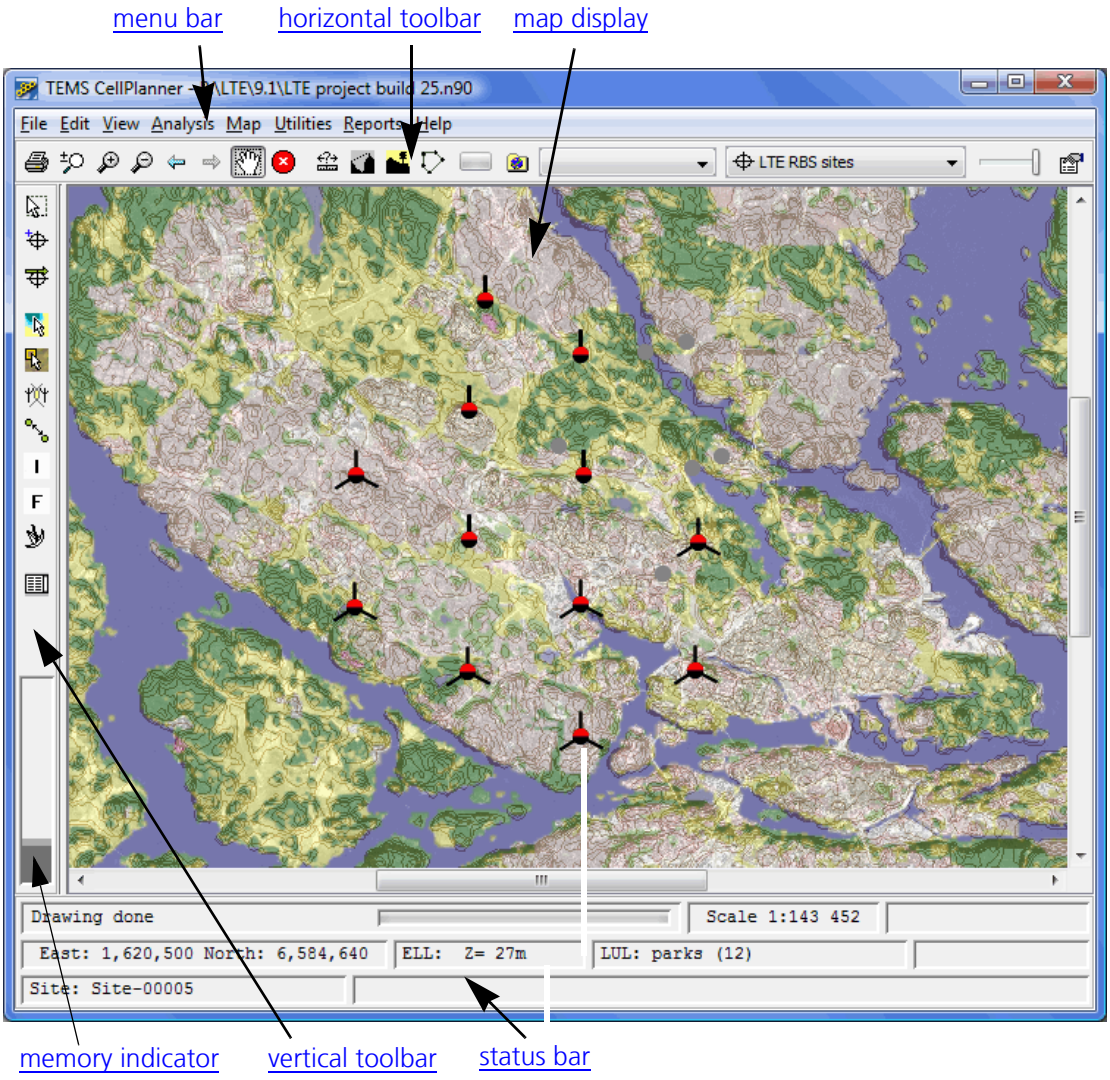
2. The TEMS CellPlanner **main** window opens with an empty map display.
3. Load a project by creating a new project or opening an existing project.
   - To create a new project, select **File↗New Project**.
     For more information, see Setting Up Projects on page 3-1.
   - To open an existing project file, select **File↗Open**.
   - To open a project stored on server, first select **File↗Login**, then select **File↗Load workspace from server**.
     See Login to the Server on page 15-6 and Create Project on the Server on page 15-7.

Exit TEMS CellPlanner

To exit TEMS CellPlanner, select **File↗Exit**. If a project is still open, save the changes before exiting.

The Graphical User Interface

The graphical user interface of TEMS CellPlanner consists of windows, menus, explorers, and other components, as illustrated in the following figure:



menu bar

See Menus on page 2-7.

map display

See Map Display on page 2-17.

horizontal toolbar

The horizontal toolbar contains icons that change the view of the map display:

Icon	Function
Print	Prints to an output device such as a printer or plotter
Continuous zoom	Zooms in (enlarges) the size of the current display and pans continuously while you hold down the cursor.
Zoom in	Zooms in (enlarges) the size of the current display.
Zoom out	Zooms out (reduces) the size of the current display
Previous view Pre-previous view	Navigates between map views
Pan	Pan moves the position of the map within the map display area by changing the center of the view.
Cancel action	Cancels the current action or operation.
Distance	Measures the distance between two positions and displays the results in meters in the status bar.
Line of sight map tool	Line of sight cursor uses an elevation map layer and obstacle (building) map layer, if loaded, along with mobile height, and antenna range, to predict areas where a mobile will be in line of sight with the base station.
Terrain profile map tool	Uses an elevation map layer, an obstacle map layer, and a land use map layer, if loaded, to show the vertical profile and land use along a line between two points.
Area editor	An area selected temporarily or stored permanently limiting the working area to a set of sites within a region to speed up analysis and make results easier to interpret.
Map favorites	Working views saved between sessions. Map favorites do not include analysis result layers.
Map symbol transparency	Changes the visibility of network layer symbols, for example site symbols, on the map display
Map properties	Opens the map properties editor

vertical toolbar

The vertical toolbar contains tools related to building and analyzing the network.

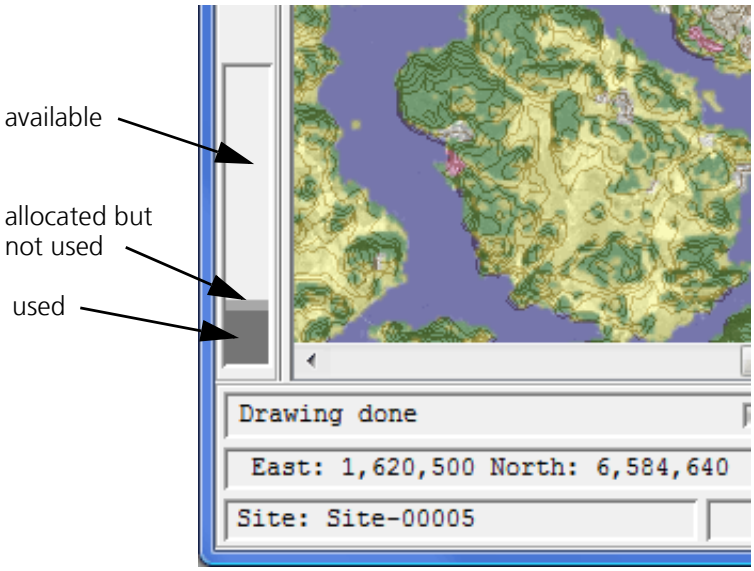
Icon	Function
Pointer	Use the three pointer cursors to select objects or sites. Sites chosen with the select cursor or a rectangle or polygon area remain selected until you select another site. Many windows in TEMS CellPlanner use the current selection to limit the scope of an operation.
Add site	Adds a site at the location of the cursor
Move site	Moves a selected site
Show instant pathloss	Shows instant pathloss for a selected site
Bin query	Runs bin query analysis for WCDMA
Handover cursor	Starts the handover cursor
Neighbor cursor	Displays neighbor cells of a selected cell
Interference cursor	Displays the interference table and shows interference values for selected cells
Frequency plan display	Displays frequencies assigned to cells
Antenna azimuth editor	Opens a tool allowing you to graphically modify azimuths of antennas
Analysis results plots	Displays a list of plots with analysis results

status bar

See Status Bar on page 2-18.

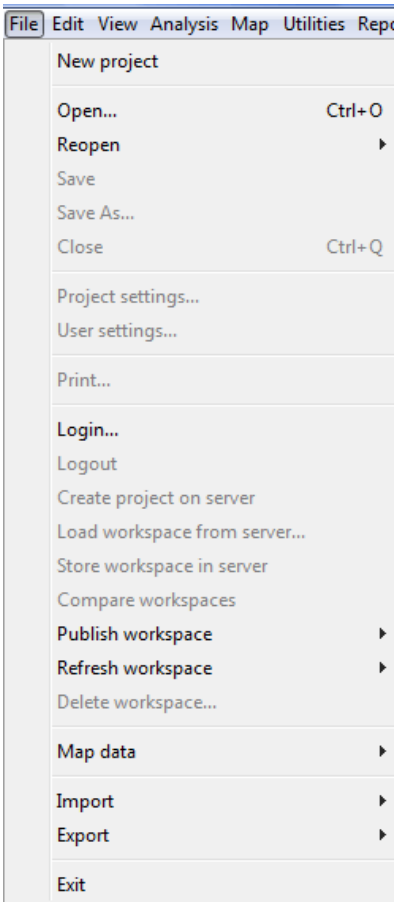
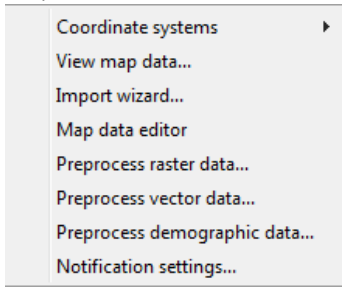
memory indicator

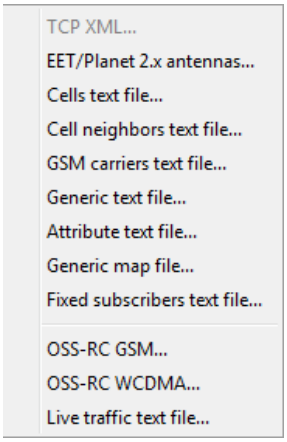
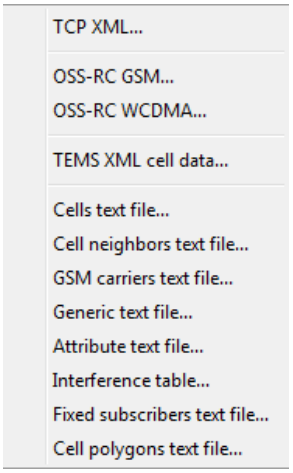
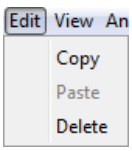
The memory indicator in the lower left corner of the main window indicates the RAM memory consumed by TEMS CellPlanner.

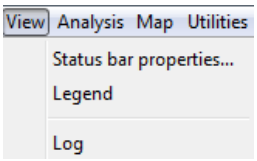
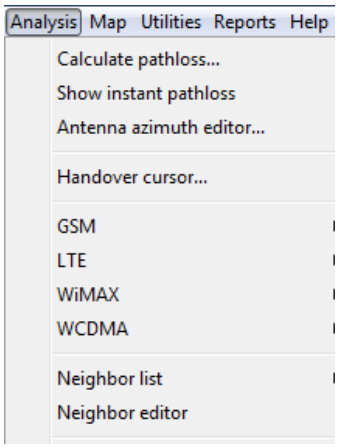
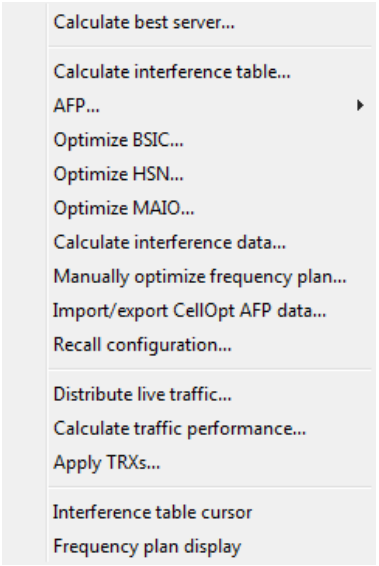


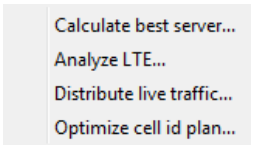
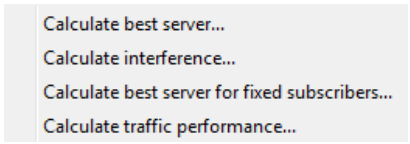
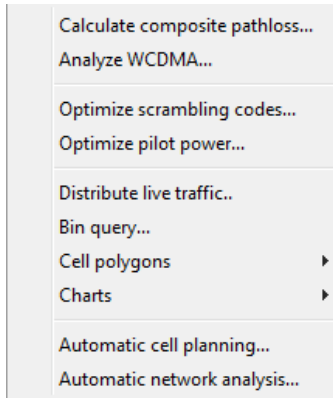
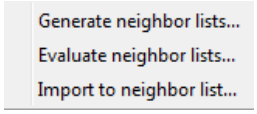
Menus

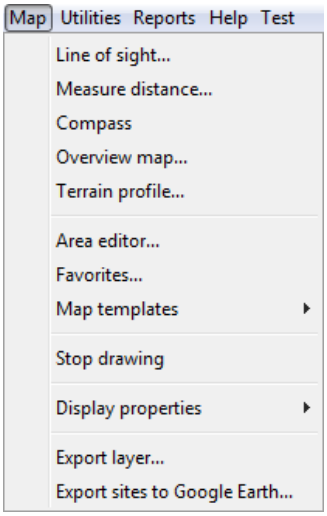
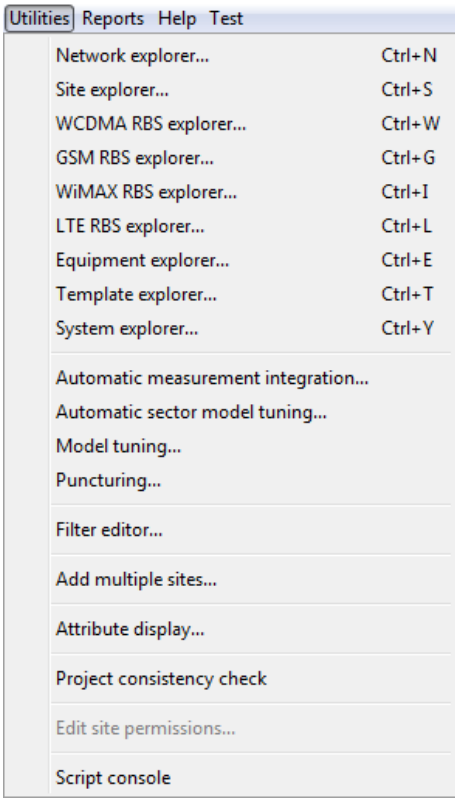
The menus are opened from the menu bar. The menus contain the following options for performing network planning and maintenance operations:

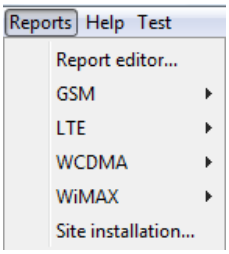
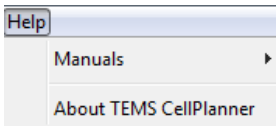
Menu	Options
File menu 	Provides functions for • project files • projects on server • project properties • import/export of geodata • import/export of project data For information on how to use this menu, see • Setting Up Projects on page 3-1 • Working with Projects on Server on page 15-1 • Printing Maps on page 9-40 • *Importing and Converting Map Data* in the *TEMS CellPlanner GeoData User's Guide* • Importing Data on page 18-1 • Exporting Data on page 19-1
Map data submenu 	Submenu to the File menu. Provides functions to add, change, view, and delete map data including coordinate systems, import and preprocessing of map data, access to the map data editor, and notification settings for import of map data. For information on how to use this submenu, see the *TEMS CellPlanner GeoData User's Guide*.

Menu	Options
Import submenu 	Submenu to the File menu. Options for importing data from: • XML files from previous versions of TEMS CellPlanner • EET/Planet 2.x antennas • Cells text file • Cell neighbors text file • GSM carriers text file • Generic text file • Attribute text file • Generic map file • Fixed subscribers text file • OSS-RC GSM (CNAI file) • OSS-RC WCDMA (Bulk CM file) • Live traffic text file For information on how to use this submenu, see Importing Data on page 18-1.
Export submenu 	Submenu to the File menu. Options for exporting data in the following formats: • TCP XML • OSS-RC GSM (CNAI file) • OSS-RC WCDMA (Bulk CM file) • TEMS XML cell data • Cells text file • Cell neighbors text file • GSM carriers text file • Generic text file • Attribute text file • Interference table (GSM) • Fixed subscribers text file (LTE, WiMAX) • Cell polygons text file (WCDMA) For information on how to use this submenu, see Exporting Data on page 19-1.
Edit menu 	Use this menu to copy or delete elements in the map display. For information on how to use this menu, see Map Display Actions on page 2-27.

Menu	Options
View menu 	Use this menu to: • View and modify status bar properties • Show or hide the map legend • View the execution log For information on how to use this menu, see Map Display on page 2-17.
Analysis menu 	Provides access to analysis functions such as calculate pathloss, show instant pathloss, antenna azimuth editor, handover cursor, neighbor list (generated, optimized), neighbor editor, and result plots from pathloss predictions and other analysis. The radio technology dependent submenus provide options to, among other, calculate composite pathloss, calculate best server, analyze the network with or without traffic, calculate interference, optimize scrambling codes, optimize pilot power, plan codes, power balancing and distribute live traffic.
GSM analysis submenu 	Submenu to the Analysis menu. Provides access to GSM-specific analysis functions. For information on how to use this submenu, see the *TEMS CellPlanner GSM User's Guide*.

Menu	Options
LTE analysis submenu 	Submenu to the Analysis menu. LTE analysis functions including calculations of best server, analysis of loaded LTE network in uplink and downlink, distribution of live traffic, and cell ID planning. For information on how to use this submenu, see the *TEMS CellPlanner LTE User's Guide*.
WiMAX analysis submenu 	Submenu to the Analysis menu. WiMAX analysis functions including calculations for best server, interference, best server for fixed subscribers, and traffic performance. For information on how to use this submenu, see the *TEMS CellPlanner WiMAX User's Guide*.
WCDMA analysis submenu 	Submenu to the Analysis menu. Provides access to WCDMA-specific analysis functions. For information on how to use this submenu, see the *TEMS CellPlanner WCDMA User's Guide*.
Neighbor list submenu 	Submenu to the Analysis menu. Provides access to neighbor optimization functions. For information on how to use this submenu, see the user guides of respective radio technology.

Menu	Options
Map menu 	Provides access to map functions, including the overview map, line of sight and measure distance cursors, compass and overview map, terrain profile, area editor, map favorites and templates, option to stop drawing, options to change map display properties and displayed map layers, export map layers, and export sites to Google Earth. For information on how to use this submenu, see the *TEMS CellPlanner GeoData User's Guide* and chapter *Working with Maps and Map Layers* in the *TEMS CellPlanner Common Features User's Guide*.
Utilities menu 	Provides access to the TEMS CellPlanner Explorers, integration of measurement data in AMI database, propagation model tuning (regular model tuning and ASMT), puncturing, the filter editor, addition of multiple sites using a site template, the cell attribute display, project consistency check, edit of site permissions, and the script console. For information on how to use this submenu, see: • Explorers on page 2-12 • Automatic Measurement Integration (AMI) on page 13-1 • Propagation Model Tuning on page 14-1 • Puncturing on page 14-1 • Filters on page 10-1 • Add Multiple Sites on page 7-4 • Set the Custom Attribute Display on page 6-11 • Check Project Consistency on page 3-22 • Script Console on page 20-1

Menu	Options
Reports menu 	Provides report options including the Report editor, GSM, LTE, WCDMA and WiMAX statistics, and Site installation. For information on how to use this submenu, see the user guides of respective radio technology and Generate Site Installation Report on page 7-7.
Help menu 	Provides installation manual, user guides, technical reference manuals, search function, information about the software version, and generation of technical info for support.

Explorers

TEMS CellPlanner provides several explorers to manage network equipment, sites, RBSs, services and traffic arranged in a tree structure.

You can select the following explorers from the **Utilities** menu:

Network explorer	Logical network hierarchy and the interconnection between sites and RBSs.
Site explorer	Network sites (or fixed subscribers) with equipment from the Equipment explorer.
LTE RBS explorer WCDMA RBS explorer GSM RBS explorer WiMAX RBS explorer	RBSs with sectors and cells with system data from the System explorer. Positions and other site data is not included in the RBS explorers.
Equipment explorer	Hardware equipment used in the network, such as RBSs, radio repeaters, feeders, TMAs, ASCs.
System explorer	System data, propagation models, types of carriers, traffic mix, and pathloss fading tables.
Template explorer	Templates for sites, RNCs, RBSs, cells, antenna systems

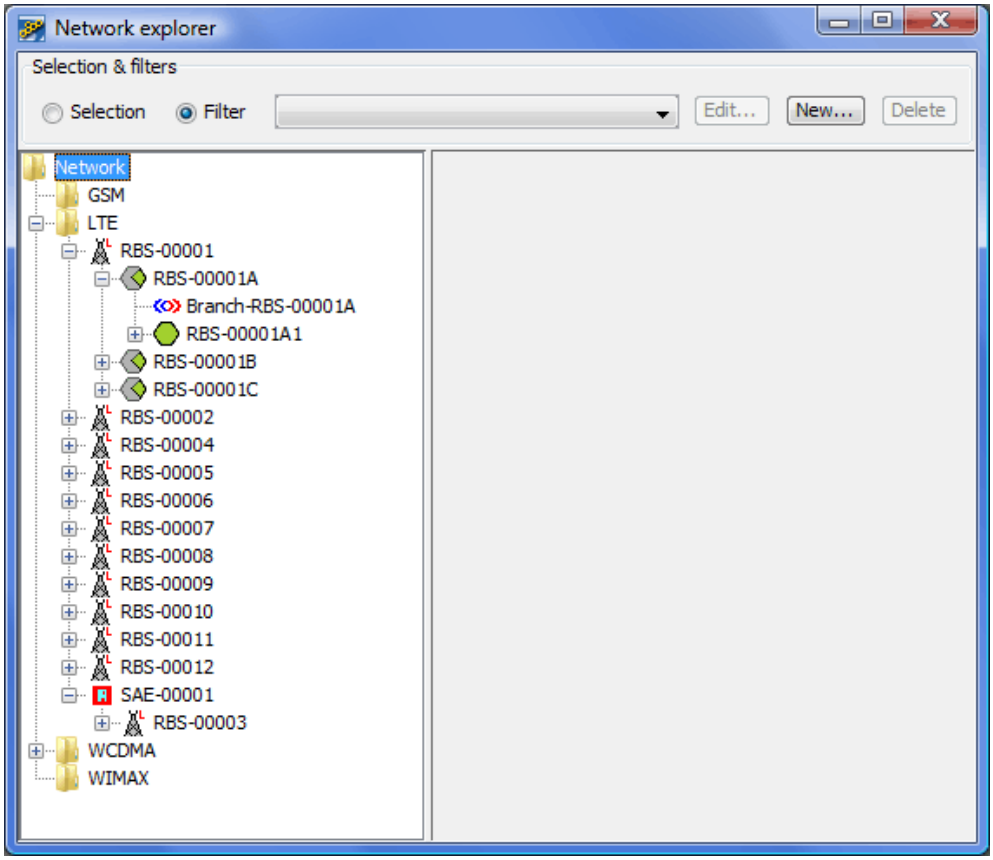
Network Explorer

The Network explorer holds the logical network hierarchy and the interconnection between RNC and RBS (WCDMA), SAE and RBS (LTE), or BSC and RBS (GSM).

You can limit the set of displayed objects by using options:

- Use a Selection to select sites in the map, see Define Map Area on page 9-36.
- Use a Filter to select objects by applying filters.
  For information on how to define filters, see Filters on page 10-1.

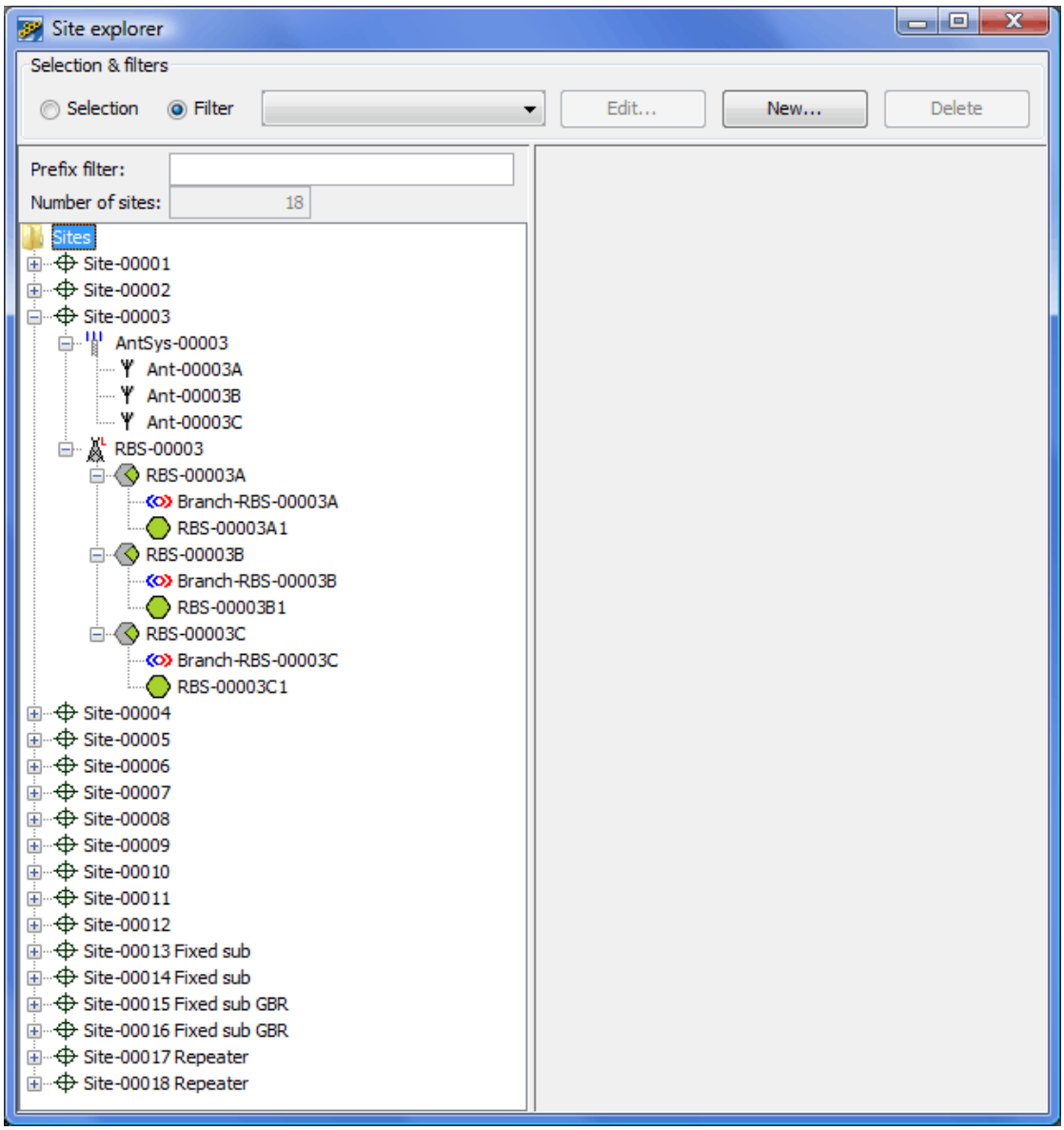
Use the **Network explorer** to add, view, change, and delete GSM, LTE, WCDMA and WiMAX networks and subnetworks. Each object in the network hierarchy has a menu accessible with the right mouse button.



The right pane of the **Network explorer** displays network specific data when you select a specific network object in the left side of the window.

Site Explorer

Use the **Site explorer** to provide an overview of the physical network of sites, and to add and modify the equipment installed on them. Each site in the explorer has a menu accessible with the right mouse button.



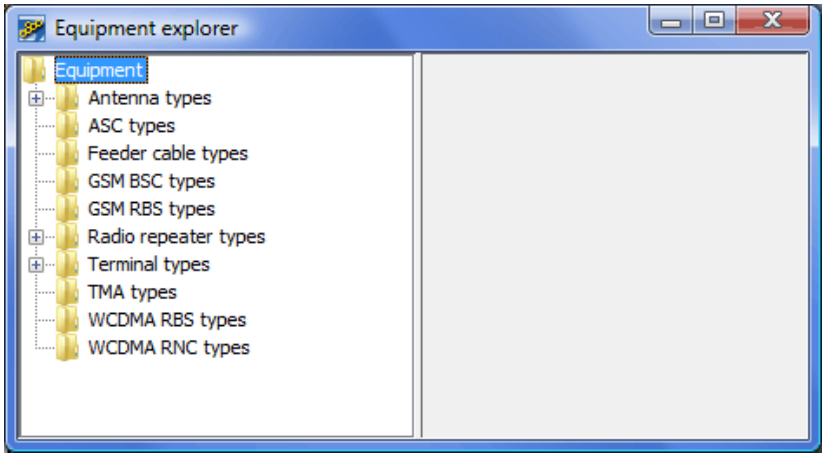
All sites are listed in site number order, regardless of the site technology.

The **Prefix filter** limits the number of displayed sites to the ones starting with the characters in this field.

The right pane of the **Site explorer** displays network data when you select a network object in the left side of the window.

Equipment Explorer

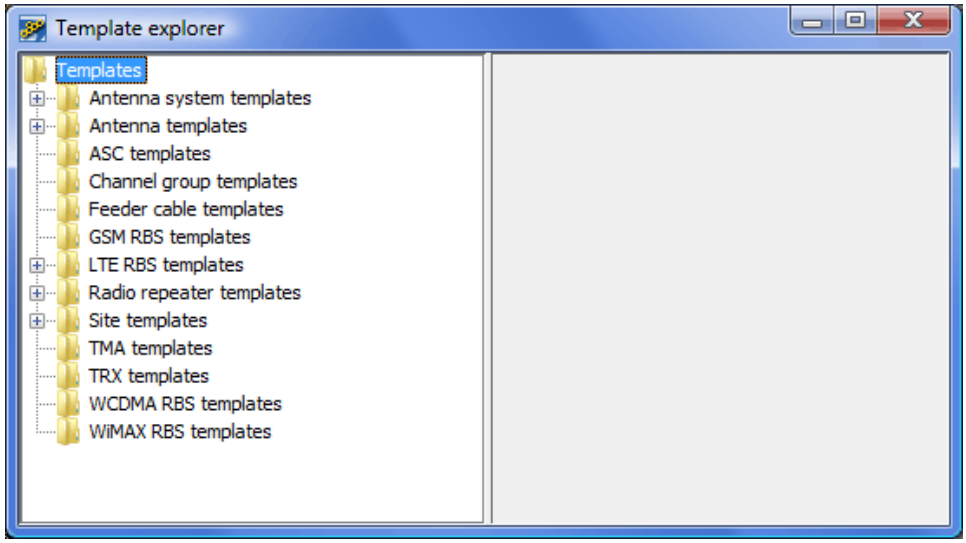
Use the **Equipment explorer** to define equipment types in a project. Network equipment includes elements such as RBSs, antennas, and feeder cables. Each object in the explorer hierarchy has a menu accessible with the right mouse button.



The right pane of the **Equipment explorer** displays equipment data when you select an object in the left side of the window.

Template Explorer

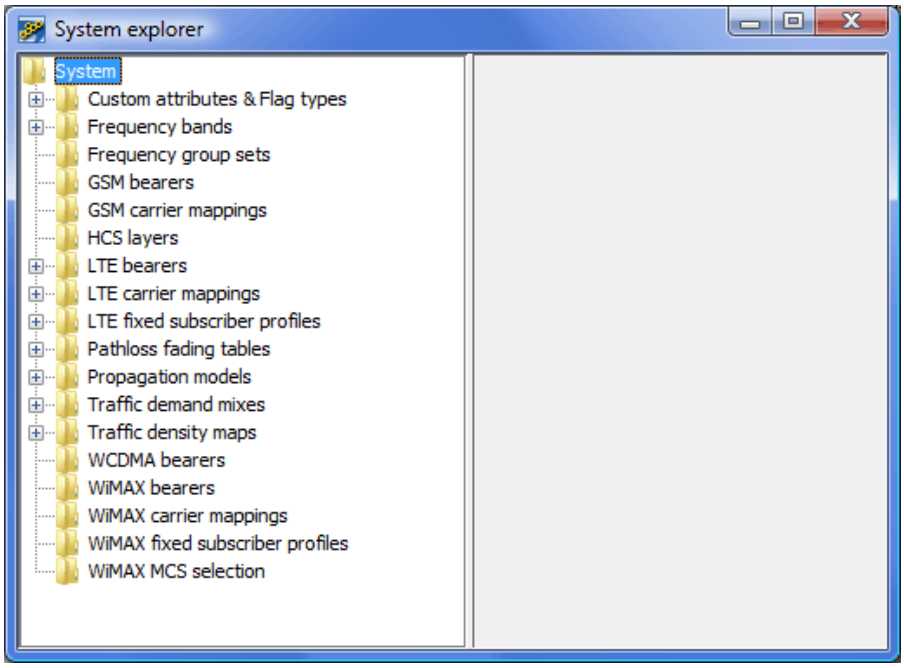
Use the **Template explorer** to define templates for network elements such as RNCs, RBSs, cells, antenna systems, and sites using selected equipment and service types. Each template in the hierarchy has a menu accessible with the right mouse button.



The right pane of the **Template explorer** displays template data when you select a template object in the left pane.

System Explorer

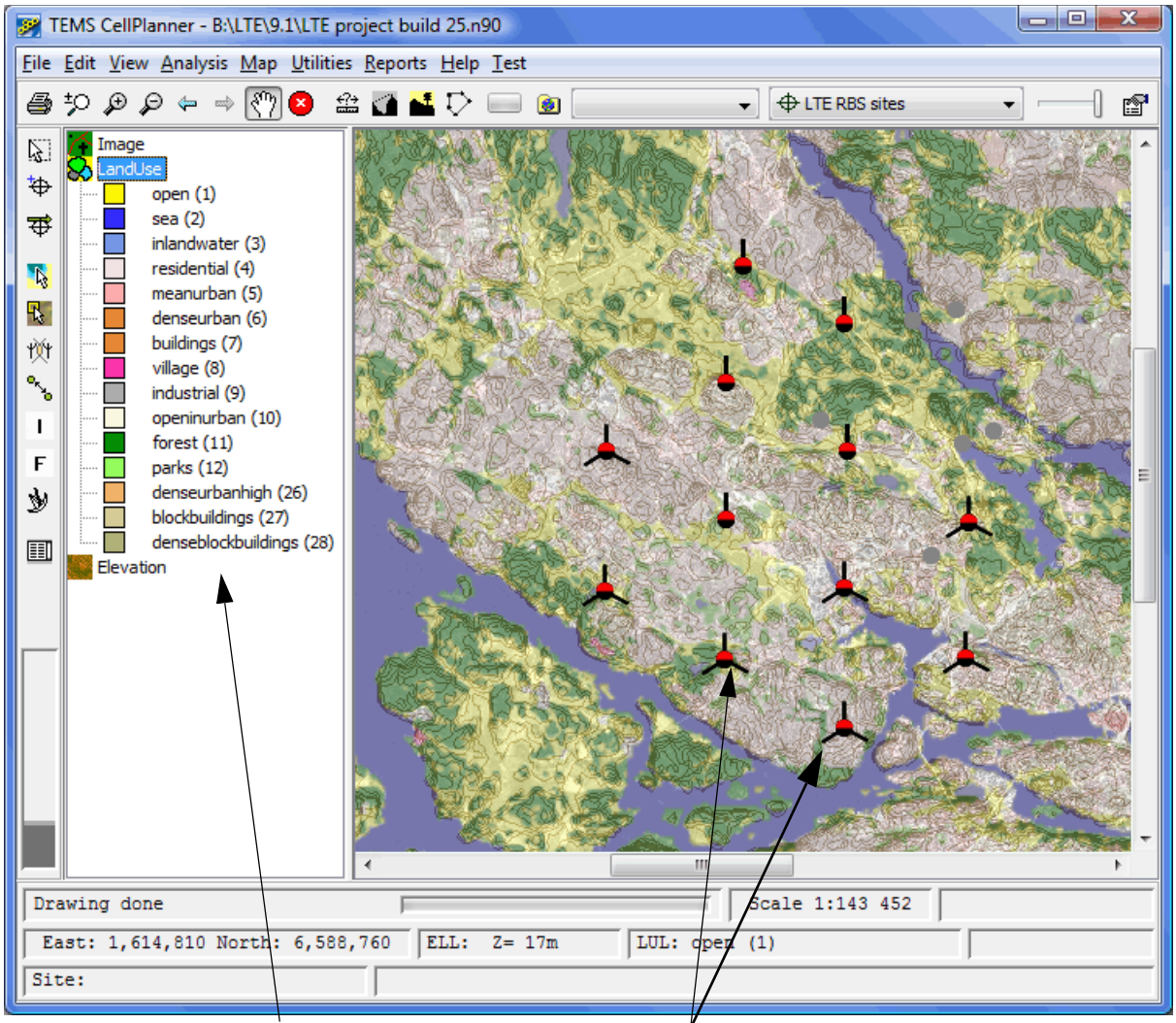
Use the **System explorer** to define systems and services including frequency bands, carriers and carrier mappings, bearers, propagation models, pathloss fading tables, traffic densities and traffic demand mixes. Each object in the hierarchy has a menu accessible with the right mouse button.



The right pane of the **System explorer** displays system data when you select a system object in the left side of the window.

Map Display

The main window of TEMS CellPlanner is also referred to as the map display window, as shown in the following example:



Map Legend

Drag the left side of the window or use **View↗Legend** from the menu bar to reveal the map legend of loaded map layers. See Map Legends on page 9-7.

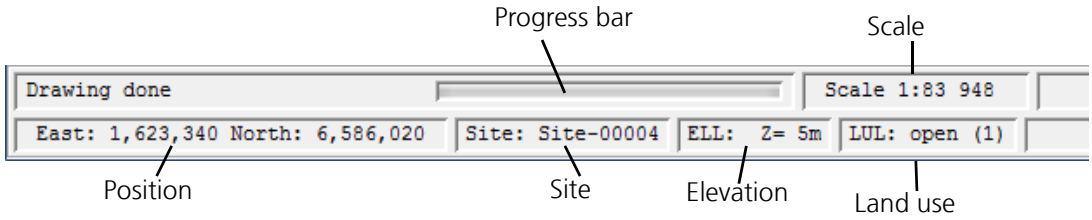
Site Icons

You can modify the appearance of the sites on the map display by editing the network map layer. See Edit Network Layer Properties on page 9-20 for instructions.

Status Bar

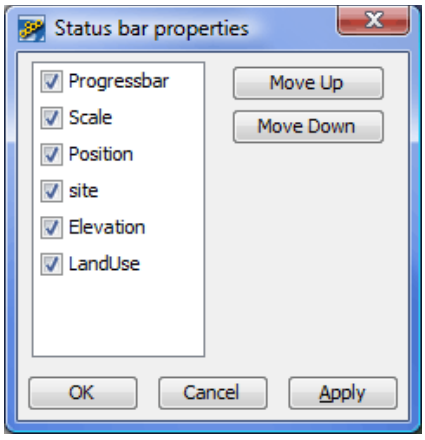
The status bar displays information about the map display, such as scale, current cursor coordinates, and map layer properties in current position.
The items on the **status bar** are wrapped when you increase or decrease the width of the window.

The fields displayed depend on the information in the layers visible in the display. The following example identifies typical fields of the status bar:

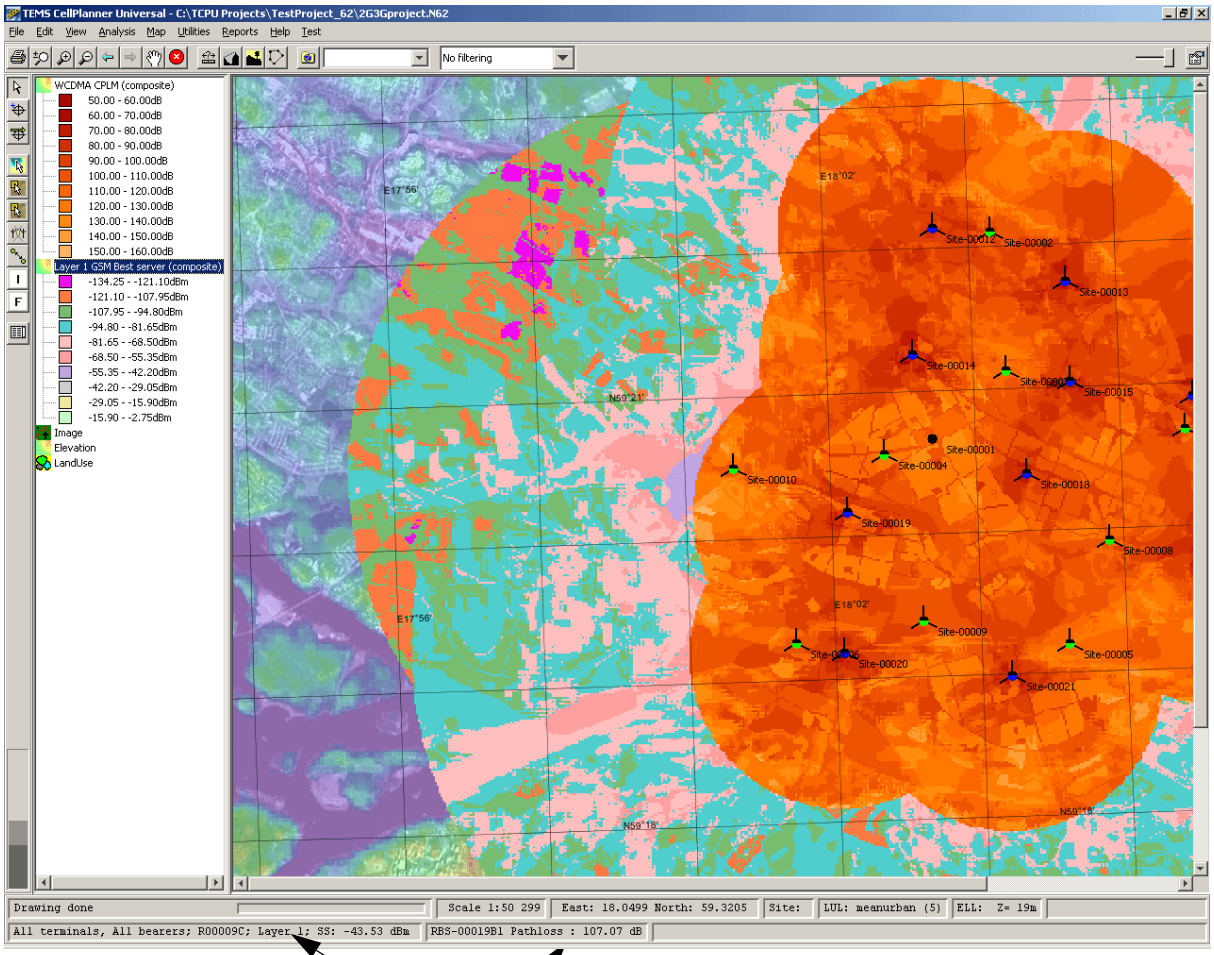


Progress bar	Shows the status of loading map layers in the map display.
Scale	Shows the current zoom level of the map relative to the actual size of the map.
Position	Shows longitude and latitude of the current cursor position on the map.
Site	Site name when cursor positioned on a site on the map.
Elevation	When an elevation map layer is loaded, this field shows the height in meters of the current cursor position on the map.
Land use	When a land use map layer is loaded, this field shows the land use category name and number associated with the current cursor position on the map.

The status bar fields can be reordered using the **View↗Status bar properties**:



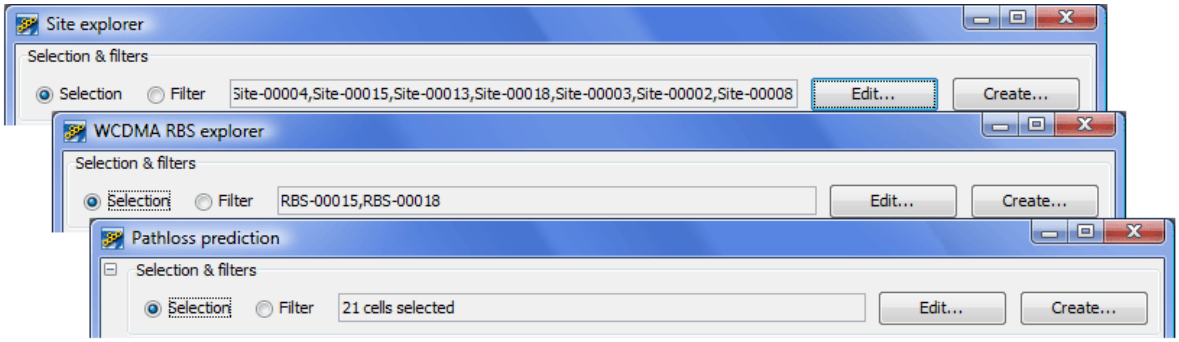
Additional fields are added to the status bar for each map layer, including plots. The following example shows two plots:

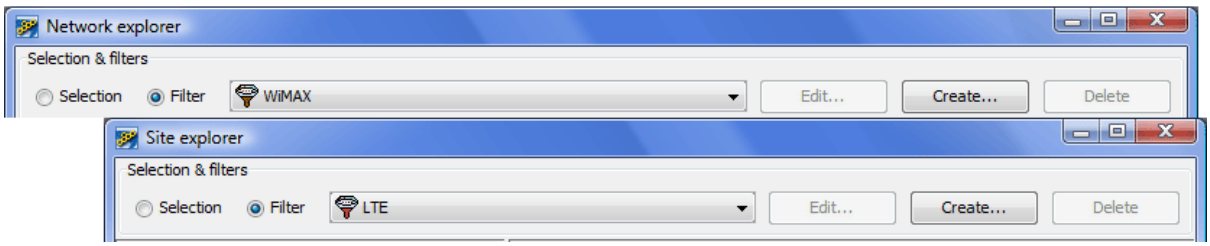


Additional status bar fields for two overlaid plots

Selection & Filters

Network, site and RBS explorers as well as analysis windows have a **Selection & filter** field where you can limit the number of sites, RBSs or cells by selecting a list of sites or use a filter:

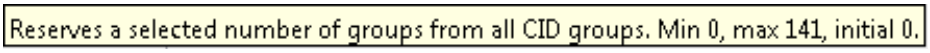




For information on how to use selection and filters refer to Use Selection of Sites from Map in Explorers or Analysis Windows on page 10-18 and Use Filters in Explorers or Analysis Windows on page 10-17.

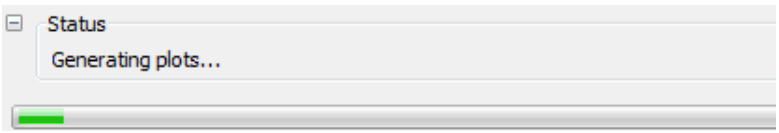
Tooltips

Most icons and fields in TEMS CellPlanner have tooltips appearing when you place the cursor on the icon or field and keep it there for two seconds:



Status Area

The bottom of each analysis window has a status area for the running process:



Common Window Actions

The following table describes common operations in TEMS CellPlanner windows:

OK	Saves the information and closes the window.
Cancel	Cancels the operation and closes the window.
Reload	Reloads values saved in the project file and undoes any unsaved changes.
Apply	Applies calculation results to the project plan.
Close	Closes the window. You have the options to save results of the algorithm or process, or discard the results.
Hide input	Hides the input fields of an algorithm processing window
Start / Pause	Starts an algorithm or process / Pauses an algorithm or process Analysis results calculated until you click Pause are retained until the algorithm or process is restarted.
Stop	Stops the algorithm or process and closes the window without saving any changes.
Save as	Creates a new file from an existing file with a new file name
Load	Loads a file
View details	Opens a window with detailed information
Import	Opens a window for importing data

Explorer Actions

All Explorers share common methods for viewing, selecting, adding, deleting, editing, copying, and moving network elements.

View in Explorers

- Double-click a folder to display a list of its elements.
- Click the + sign to display elements or sub-elements.
- Click the - sign to hide sub-elements.

Select in Explorers

1. Select an element by clicking (left-clicking) on it.
2. To select multiple elements, Ctrl-Click each element.
3. To select a continuous group of elements, click on the first element of the list, and Shift-Click the last element of the list.

Add in Explorers

Highlight an element in the tree and right-click to display the menu. Select an item to add. The element is added to the tree.

Delete in Explorers

Select one or more elements in the tree, right-click to display the menu, and select **Delete**. TEMS CellPlanner deletes the element(s) with sub-elements from the tree.

Edit in Explorers

Select one or more elements in the tree to display information on the right side of the window. When you select multiple elements, you can change only the fields with values common to all the elements.

Copy/Paste in Explorers

You can use an existing object as a template, and easily copy it to another network element. For example, you can select an RBS in the Network explorer, copy it, and paste the copy on a site in the Site explorer.

Use copy and paste as follows:

1. Select an object the tree on the left side of an explorer window.

2. Select **Copy** from the right-mouse menu.
3. Select a destination object for copying the object attributes. The destination object may be in the same explorer or another explorer.

   If the source object may not be attached to the destination object, the paste is cancelled and an error message indicates the reason.

Copy/Paste Restrictions

The following restrictions apply to objects copied or pasted:

Action	Results
Copying RBS	Sectors, UTRAN cells, antenna branches, and UTRAN relations are copied.
Copying antenna branch to GSM cell belonging to same site	If you copy the antenna branch to a GSM cell or sector belonging to the same site as the associated objects, the old associations remain.
Copying antenna branch to GSM cell or sector at another site	Associations are set to the corresponding objects of the antenna system on that site. • If more than one instance of any of the objects in the new antenna system exist, you must choose among them. • If no antenna system exists on the new site, the antenna system of the source site is copied to the new site.
Copying GSM cell	GSM cells are associated with one or more HCS layers. The HCS layer(s) must be included in one of the HCS bands of the BSC to which the GSM cell belongs. If the BSC is in the new context of the cell, or if the HCS layer is not included among the HCS bands of the BSC, the association is cleared.
UTRAN cell and GSM cell	Cells have the following objects: • Location Area: UTRAN cell and GSM cell • Service Area: UTRAN cell • Routing Area: UTRAN cell and GSM cell If you copy or paste the cell to a sector or BTS belonging to the same subnetwork as the original objects, the original associations remain. If you copy the cell to a Sector or BTS belonging to another subnetwork, the associations are made with the corresponding objects in that subnetwork. • If more than one instance of any of the objects in the new cell exist, you must choose among the instances. • If no cell exists on the new site, the cell characteristics of the new subnetwork are copied to the new site.

Action	Results
HCS band	The HCS band is associated with HCS layer objects. GSM business rules require that the layers shared among several HCS bands in one BSC must be in ascending order between the HCS bands, as follows: • The lowest layer number in the copied HCS band is higher than the highest number in the previous HCS band in that BSC • The highest layer number in the copied band is lower than the lowest number in the next HCS band in that BSC.
Copying HCS layer	When copying an HCS layer to an HCS band the GSM business rules apply. The following extra rules are applied when checking an HCS band in a BSC: • The layer number in the layer is higher than the highest number in the previous HCS band in that BSC • The layer number in this layer is lower than the lowest number in the next HCS band in that BSC.
Copying RBS	To copy several RBSs, select multiple RBSs, copy them, and paste them to the new network or RNC.
Copying subnetwork, RNC, MSC, and BSC	Only the object is copied. The structure and relationships to the objects are **not** copied.

Drag/Drop in Explorers

You can attach or move objects to other objects by dragging them onto the destination object, for example to:

- move a cell from one RBS to another
- move a set of WCDMA RBSs in the Site/WCDMA/Network explorer to an RNC in the Network explorer

The symbol Ø appears when the cursor is placed on an object to which you can *not* drop a dragged object. The symbol disappears when the cursor is placed on an object accepting the dragged object.

Global Edit in Explorers

Use global edit to select multiple objects of the same type and apply the same changes to all of them, as in the Example of Global Edit on page 2-26.

You can group edit most but not all attributes.

1. Open the explorer containing the objects you want to modify.
2. Optionally limit the number of objects by using a filter or a site selection.
3. Select parent objects in one of the following ways:

   a. To change all objects of the same type, for example all sites:

- Left-click the parent object.
- Press **Ctrl-a**. All objects of the same type are highlighted in the explorer tree.

b. To change a set of consecutive objects, for example sites 1-5:

- Left-click the first parent object, in the example site 1
- Press **SHIFT** and left-click the last parent object, in the example site 5. All objects in the selected range are highlighted in the explorer tree

c. To change a set of non-consecutive objects, for example sites 2, 4 and 6:

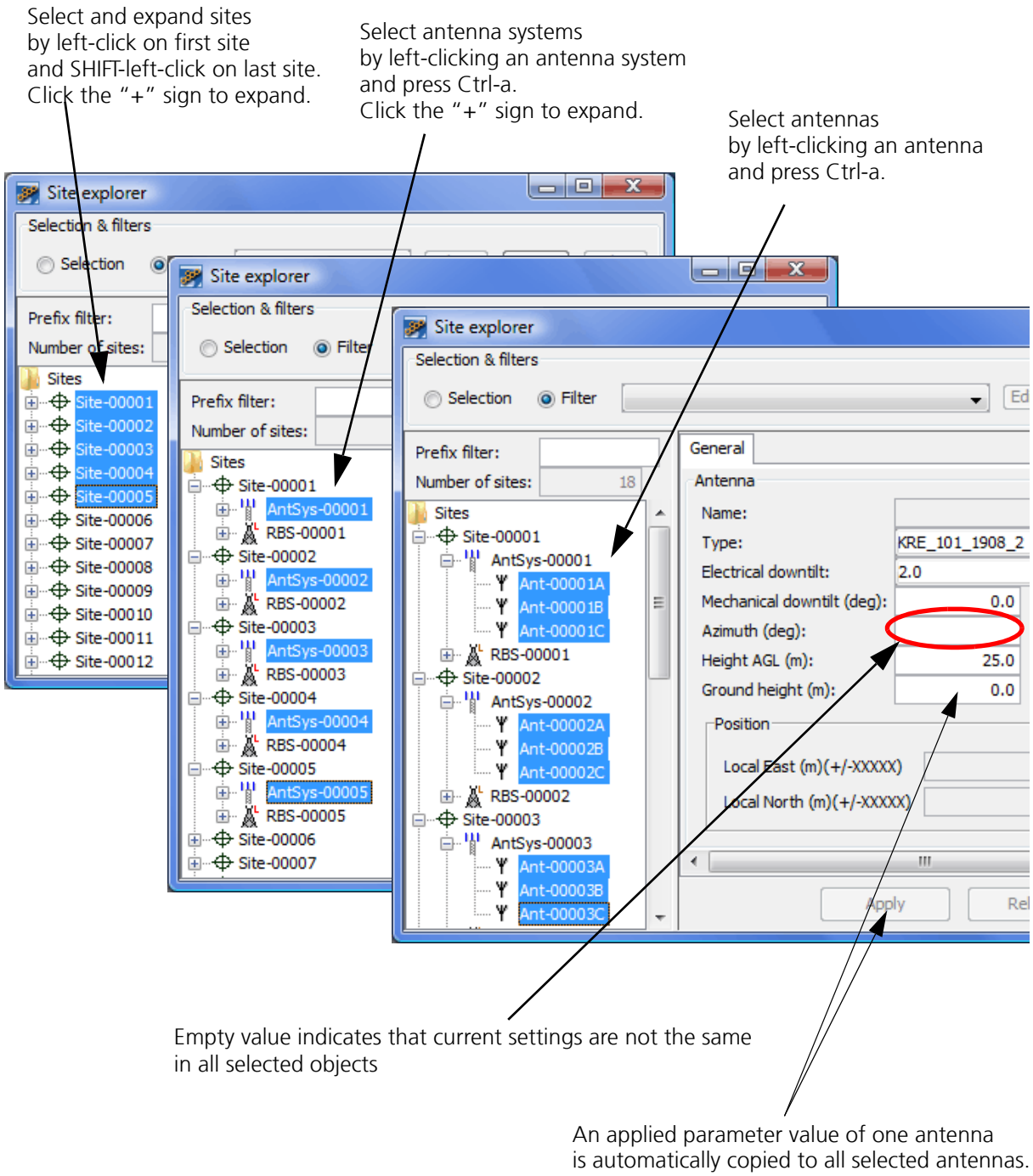
- Left-click the first parent object, in the example site 2
- Press **Ctrl** and left-click the next parent object, in the example site 4
- Repeat previous step until all parent objects are selected

4. Click **+** at any of the highlighted parent objects to expand them all.
5. Repeat Step 3 and Step 4 until you reach down to the object to edit.
6. Select the object to edit. The parameters appear in the right side of the window.
7. Change the parameter values for the group of selected elements, or add sub-objects. Only the parameters whose values are common to the highlighted objects can be edited, other parameters are grayed out.
8. To save the changes, click **Apply**. The changes you made are applied to all highlighted objects in the explorer left pane.

   To cancel the changes and reload previous values, click **Reload**.

Example of Global Edit

The example below shows multiple edit of antenna attributes in the **Site explorer**:



Map Display Actions

Select Sites in Map Display

Follow these steps to select sites one by one in the Map Display:

1. Place the cursor on the site and **Left-click**. The color of the selected site symbol is changed to red.
2. To select more sites, place the cursor on each site and press **Ctrl-Left-click**.

You can also select sites within an area, see Use Selection of Sites from Map in Explorers or Analysis Windows on page 10-18.

Copy/Paste in Map Display

Follow these steps to copy and paste sites in the Map Display:

1. Select one or more sites in the map display.
2. To copy sites, press **Ctrl-c,** or right-click and select **Copy**.
3. To paste copies of the site(s) onto the map display, press **Ctrl-v**, or right-click and select **Paste**. Each copy is placed diagonally below and to the right of the original site.

   After pasting the copies, the selection changes so that the copies are selected instead of the origins. Use the Move Site option to move the copies to the suitable new locations.

3
Setting Up Projects

This chapter describes how to work with and configure TEMS CellPlanner projects, and the basic project file procedures, such as create, save, open, close, and backup of project files.

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How to Work with a TEMS CellPlanner Project . . . 3-3
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- Open Existing Project . . . 3-6
- Import Existing Project . . . 3-6
- Use a Demo Project . . . 3-7

Project Specific Settings . . . 3-8
- Define General Project Settings . . . 3-8
- Select Coordinate System for Project . . . 3-9
- Add Map Layers to Projects . . . 3-11
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User Specific Settings . . . 3-16
- Define User Settings . . . 3-16
- Auto-Back Up Project Files . . . 3-19
- Restore Project File from Backup . . . 3-20
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Check, Save and Close a Project . . . 3-22
- Check Project Consistency . . . 3-22
- Save Project . . . 3-24
- Close Project . . . 3-24

About TEMS CellPlanner Projects

A network plan built in TEMS CellPlanner is developed within a *project*, stored as a file for single-user access, or in a database on a TEMS CellPlanner server to be shared with other planners.

Note: Your changes to the network plan are stored persistently first when you explicitly **save** the project. The **apply** operations in the tool do not save changes in the project persistently.

The flow of working with a network plan in TEMS CellPlanner varies between different projects. The flow in this chapter however follows a standard order that can be applied to most projects.

How to Work with a TEMS CellPlanner Project

This section summarizes the basic TEMS CellPlanner project related procedures. The order of procedures follows a standard order for defining a project in TEMS CellPlanner.

Follow this process to build a TEMS CellPlanner project from scratch, up to the level where you can obtain plots and reports:

- A. Prepare Map Data
- B. Define Project
- C. Build Network Plan
- D. Add Analysis Information
- E. Analyze Network Plan
- F. Generate Plots and Reports

Optional:

- Exchange Data

A. Prepare Map Data

A geodata administrator must ensure that the map data to use in TEMS CellPlanner is available in the expected format. See *Map Data Administrator's Process* in the *TEMS CellPlanner GeoData User's Guide*.

B. Define Project

When the map data is available, you can initiate the project with basic information using the following process:

1. Create, Open or Import a Project
2. Define Project Specific Settings
3. Define User Specific Settings
4. Check, Save and Close a Project

C. Build Network Plan

When you have opened a project, you can fill it with information about sites, RBSs, antennas, and other equipment.

With this minimal setup, you can calculate pathloss and generate a composite pathloss matrix.

The process of building a network plan depends on the radio technology, and details are described in each radio technology specific user guide.

The steps below outline a minimal process for building a network plan:

1. Define frequency bands
2. Define propagation models
3. Import antenna types
4. Define other equipment types
5. Create templates
6. Add sites, RBSs, cells, and so forth

D. Add Analysis Information

When you have created a network plan, you can extend it to include information required by analysis algorithms:

1. Add services and/or radio bearers
2. Add terminal classes
3. Add pathloss fading table for radio technologies where fading tables used
4. Add traffic density maps (or select uniform demand)
5. Generate neighbor lists

E. Analyze Network Plan

When the network plan includes enough information for analysis, you can perform analysis of pathloss, neighbors, coverage (best server), interference and traffic performance, for example.

The analysis functions are described in the user guide of the respective radio technology.

F. Generate Plots and Reports

When analysis has been performed, see E. Analyze Network Plan, you can generate plots or reports for most analysis results.

The available plots and reports are described in the user guide of the respective radio technology.

Exchange Data

You can exchange data with other tools by import and export of information, for instance with TEMS Investigation, TEMS Automatic, TEMS Pocket, and Ericsson's OSS-RC.

Refer to the following sections for more information:

- Interfaces to Other Tools on page 17-1 for an overview of interfacing tools
- Exporting Data on page 19-1 for a complete list of what can exported, and how to do
- Importing Data on page 18-1 for a complete list of what can imported, and how to do

Create, Open or Import a Project

Start your work with the network plan by creating a new project, or open an existing project to modify an initiated network plan.

Create New Project

1. Select File↗New.
2. Proceed with Define General Project Settings on page 3-8.

Open Existing Project

Use this procedure to open an existing project stored as a project file.

Note: *If the project is stored in database on a server, see instead chapter Working with Projects on Server on page 15-1.*

Prerequisites

- You have access to the project file.
- The project is compatible with your TEMS CellPlanner client version.
- The TEMS CellPlanner client is started.
- No other TEMS CellPlanner client has opened the same project file.

Procedure

Do as follows to open an existing project:

1. Select File↗Open to display the **Open** window.
2. Browse to the directory where the project file is stored. The project files of the same extension as displayed in Files of type are listed.
3. Select the project file from the list and click Open. The file is loaded into under condition that no other TEMS CellPlanner client keeps the file open. In the latter case, a warning is displayed.
4. Proceed with Define General Project Settings on page 3-8.

As an alternative, you can select File↗Reopen to open a project file that has already been opened from the currently installed TEMS CellPlanner client.

Import Existing Project

As an alternative to Open Existing Project from a project file you can import a project in XML format. This method is required if the project was created in an older TEMS CellPlanner version. XML files are forwards compatible, project files are not.

You can also import a demo project to get acquainted with how to use TEMS CellPlanner to plan a network of a specific radio technology.

See:

- Import Project XML Files to TEMS CellPlanner Client on page 18-4
- Import Existing Project on page 3-6

Use a Demo Project

For your convenience, TEMS CellPlanner provides complete, ready-to-use demo projects in XML format for all supported radio technologies. The demo projects are installed together with the TEMS CellPlanner software.

Do as follows to use a demo project:

1. Select **File↗Import↗TCP XML** as described in Import Project XML Files to TEMS CellPlanner Client on page 18-4.
2. Browse to the location of demo projects:

   ```
   C:\Program Files\Ascom\TEMS Products\TEMS CellPlanner
   <version>\Client\Demo\<technology>\Projects
   ```

3. Select the file to import, as in the LTE demo project example below:

   ```
   C:\Program Files\Ascom\TEMS Products\
   TEMS CellPlanner <version>\Client\Demo\<technology>\
   Projects\LTE\LTEDemo.xml.
   ```

Project Specific Settings

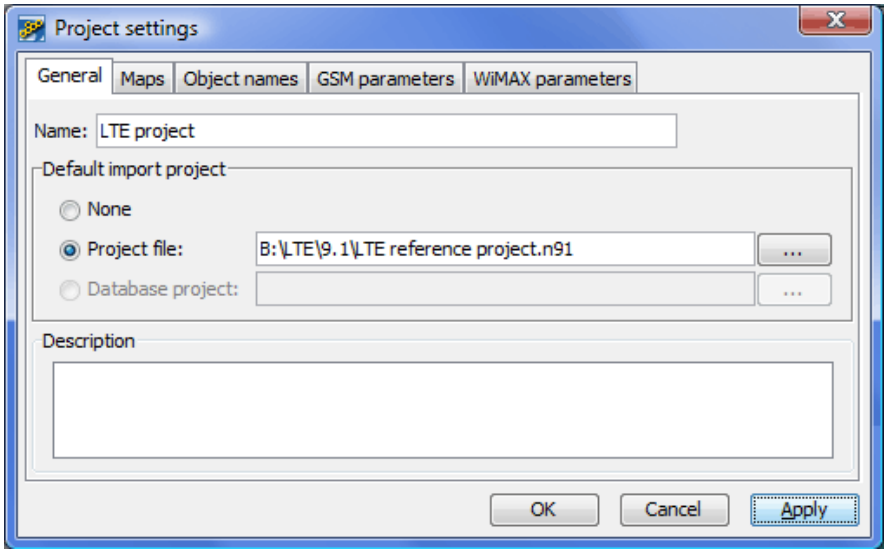
The project specific information is saved in the project, and configured from **File↗Project settings**:

1. Define General Project Settings - in the General tab
2. Select Coordinate System for Project - in the Maps tab
3. Add Map Layers to Projects - in the Maps tab
4. Define Object Names - in the Object names tab
5. For GSM projects you need to set GSM parameters. Refer to the *TEMS CellPlanner GSM User's Guide* for more information.
6. For WiMAX projects you need to set WiMAX parameters. Refer to the *TEMS CellPlanner WiMAX User's Guide* for more information.

Define General Project Settings

Do as follows to define general project information:

1. Create, Open or Import a Project to open the **Project Settings - General** window.
2. Enter the project **Name** and optionally a **Description**.
3. Optionally select a **Default import project** for reuse of equipment types or system data.
4. The result might look as in the following example:



5. Click **Apply** to preserve the settings.

6. If needed, proceed with other project settings:
   - Select Coordinate System for Project
   - Add Map Layers to Projects
   - Define Object Names
   - GSM parameters (if relevant)
   - WiMAX parameters (if relevant)
7. Click **OK** to close the window.

Fields on Window "Project settings - General"

Name	Name of the project. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Default import project	Default project from which you can reuse terminal types, frequency band settings, custom attributes, and so on. See Import Equipment Types from Another Project on page 5-33 and Import System Data from Another Project on page 5-4 respectively. Options: • **None** (initial setting) - even if you select this option you can still manually select an import project from the equipment and system explorers • **Project file** - the default project is stored as a project file in the file system; enter path and file name • **Database project** - the default project is stored on server; enter the name of the project on server
Description	Optional description of the project

Select Coordinate System for Project

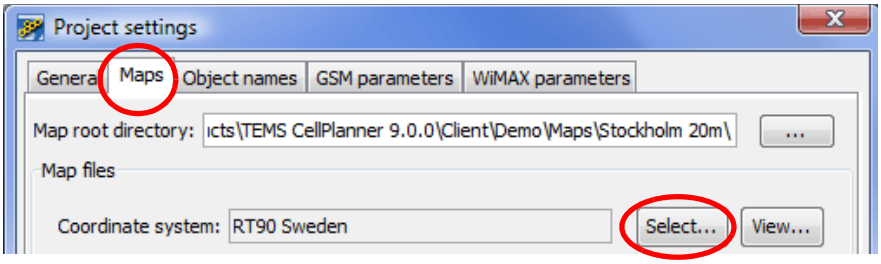
The map you select for your projects must be aligned according to a coordinate system. Use this procedure to select a UTM coordinate system or a geographic reference system for your project.

Important: The coordinate system of the project must be the same as in any imported data with positions, for example site positions. The imported positions will otherwise not match to the map in your project.

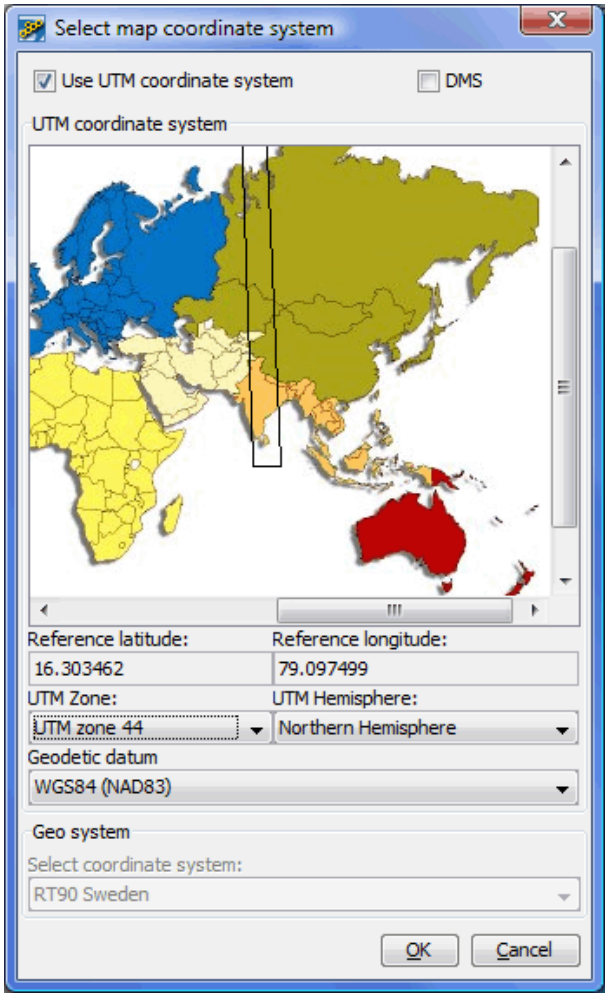
Read about coordinate systems in the *TEMS CellPlanner GeoData User's Guide*.

Do as follows to specify a coordinate system for an opened project:

1. Select **File↗Project settings**, select the **Maps** tab, and click **Select** at the **Coordinate system** field.



2. The **Select map coordinate system** window appears, listing the currently defined coordinate systems:



3. To display latitude and longitude in DMS format, select option **DMS**.
4. To configure a *UTM coordinate system*, select the following:

- **UTM coordinate system** to enable the UTM zone fields
- **UTM Zone** and **UTM Hemisphere** manually or from the map
- **Geodetic datum**

To configure a *geographic reference system*, do as follows:

- clear option **UTM reference system** to enable the **Geo system** field
- select a **coordinate system**

Optional: You usually select a predefined coordinate reference system. For advanced use, you may use a customized or new coordinate reference system. Read more on this topic in the *TEMS CellPlanner GeoData User's Guide*.

5. Click **OK** to return to the Project settings window.

Fields on Window "Select map coordinate system"

DMS	Changes the format of the Reference latitude and the Reference longitude from Degree-Decimal to Degree-Minute-Second.
Use UTM coordinate system	Option enabling **UTM coordinate system** parameters. You can set UTM parameters either by clicking in the map, or by selecting values from the UTM parameters: • **Reference latitude** - Map display center latitude for opening a project when no elevation or network map layer exists. Read-only. • **Reference longitude** - Map display center longitude for opening a project when no elevation or network map layer exists. Read-only. • **UTM Zone** - One of 60 UTM zones. • **UTM Hemisphere** - Northern or Southern. The hemisphere determines other UTM parameters. • **Geodetic datum** - The rotational ellipsoid and its position and orientation to the actual center of the Earth, using the geodetic datum position and orientation parameters.
Geo system	Selects a geographic reference system from a pre-defined list. Enabled if **UTM reference system** is not set.

Add Map Layers to Projects

All geodata to consider in pathloss calculations must be defined as map layers in the project settings, as described in this procedure. If you share the project with other planners, these settings apply to all users of the project.

Note: *The map layers in the project settings only tell what is considered in calculations, they are not the ones displayed on the map. Map layers shown on the map display must be selected in the Map properties, see* Add Map Layers for Display *on page 9-9*.

Read more about map layers in the *TEMS CellPlanner GeoData User's Guide*.

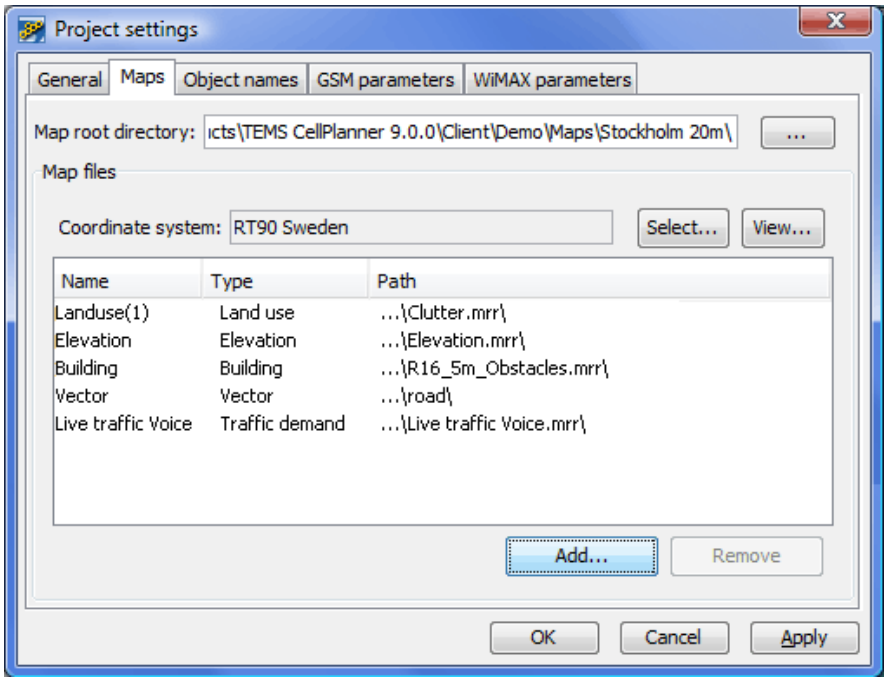
Prerequisites

- You have access to a map root directory with at least one land use and one elevation map database.
- A project is opened.

Procedure

Follow these steps to add map layers to projects:

1. Select **File↗Project settings** and select tab **Maps**.
2. In the **Map root directory** field, enter the path to the top directory where the map files are stored.
3. Select the directory containing the maps to use, and click **Open**.
4. To add a map layer, click **Add**. The **Select map dataset** window is displayed.
5. Select map layers from the list and click **OK**. You should add at least one landuse and one elevation map layer for use in predictions.
6. The selected map layers are listed in the **Maps** tab window:



7. Advanced use: To change the type of a map layer, highlight the row, click the **Type** column and select the appropriate type from the list.

8. To rename a map layer, select the Name column of the relevant row and edit the name.
9. Click **Apply** to preserve the settings.
10. Click **OK** to apply and close the window.

Fields on Window "Project settings - Maps"

Map root directory	The directory where map data is stored
Coordinate system	The coordinate system used with the selected map
Select	Opens a window from which you can change coordinate system
View	Displays the project coordinate system parameters, as well as datum and ellipsoid parameters.
(List of map layers)	Selected map layers *to use for calculations*. When you add map layers, you select files from the configured **Map root directory**. Example of map layers: • Building • Elevation • Image • Land use • Text • Traffic demand • Vector • Live traffic data

Define Object Names

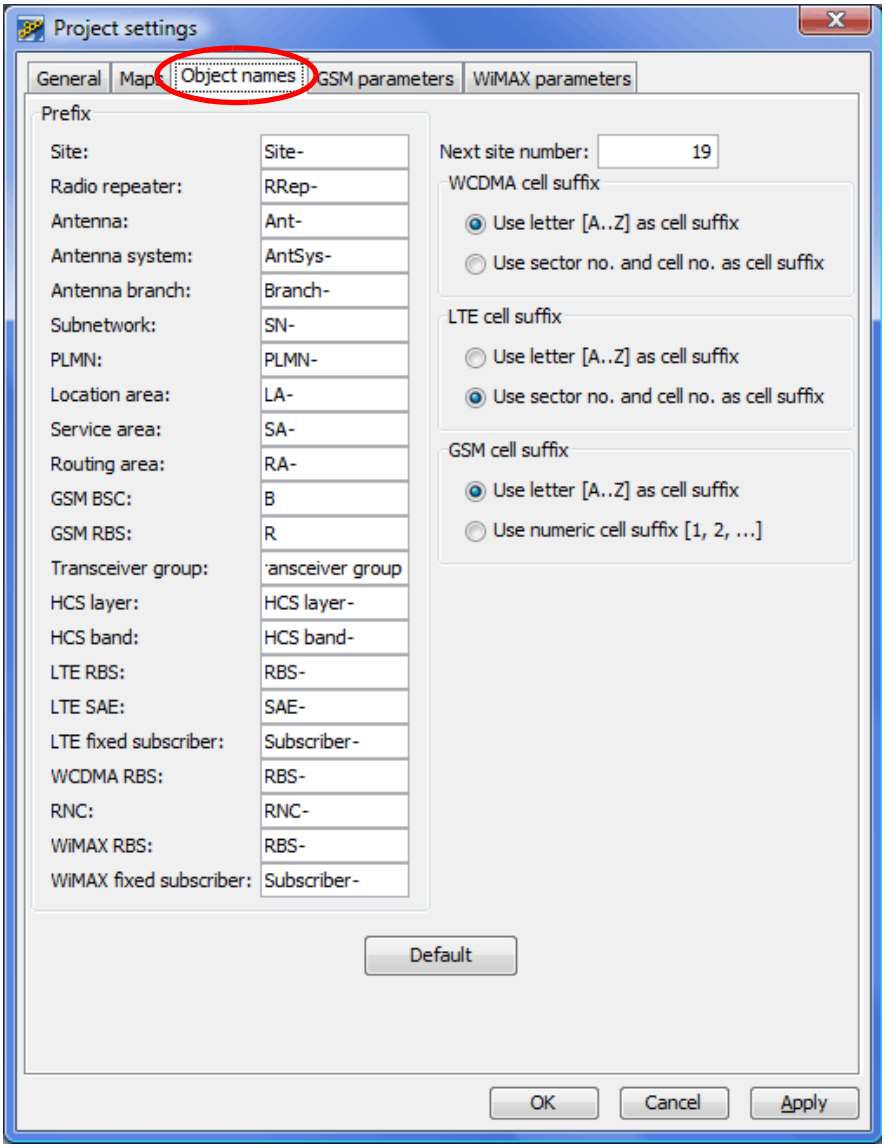
The text displayed in the network layer and in explorers can be customized to use non-default prefix and suffix values. Use this procedure to define the naming conventions of network element objects in your project.

You configure a prefix per network element, for example "Site-", "RBS-", and suffix rules for numbering of cells and sectors.

Do as follows to define naming rules for an open project:

1. Select **File↗New Project** to display the **Project Settings** window.

2. Click the **Object names** tab. The window displays the object names for each network element.



3. Change object prefix and suffix rules. If desired, click **Default** to load initial settings.
4. If you want new sites to be numbered starting from a certain number, enter the start value as the **Next site number**.
5. Select alphabetical or numeric numbering of cells and sectors by selecting appropriate **WCDMA / LTE / GSM cell suffix**.
6. Click **Apply** to preserve the settings.
7. Click **OK** to close the window.

Fields on Window "Project settings - Object names"

Prefix	Prefixes used for network objects. The ID of an object is appended to this prefix.
Next site number	Start value for numbering of new site. Default = 1.
WCDMA cell suffix	Numbering rules for new WCDMA sectors and cells, either of: • Use letter [A - Z] as cell suffix Examples: 1st cell on 1st sector = RBS-00001A 2nd cell on 1st sector = RBS-00001B 1st cell on 2nd sector = RBS-00001C • Use sector number and cell number as cell suffix (default) Examples: 1st cell on 1st sector = RBS-00001A1 2nd cell on 1st sector = RBS-00001A2 1st cell on 2nd sector = RBS-00001B1
LTE cell suffix	Numbering rules for new LTE sectors and cells, either of: • Use letter [A - Z] as cell suffix Examples: 1st cell on 1st sector = RBS-00001A 2nd cell on 1st sector = RBS-00001B 1st cell on 2nd sector = RBS-00001C • Use sector number and cell number as cell suffix (default) Examples: 1st cell on 1st sector = RBS-00001A1 2nd cell on 1st sector = RBS-00001A2 1st cell on 2nd sector = RBS-00001B1
GSM cell suffix	Numbering rules for new GSM cells, either of: • Use letter [A - Z] as cell suffix Examples: 1st cell on 1st RBS = RBS-00001A 2nd cell on 1st RBS = RBS-00001B 1st cell on 2nd RBS = RBS-00001C • Use numeric cell suffix [1, 2, ...] (default) Examples: 1st cell on 1st RBS = RBS-000011 2nd cell on 1st RBS = RBS-000012 1st cell on 2nd RBS = RBS-000021
Default	Resets all object names to default settings

User Specific Settings

The following private, project independent, settings are stored in your `C:\users\<user>\TEMSTCP\<version>\Home` folder:

- calculation results directory, where your analysis results are saved
- AMI database directory, for storage of measurement data
- address and login info to server with TEMS Automatic database
- auto backup settings for loaded projects
- working area determining which sites to load into memory
  (that you select a working area at all is project independent, but which area to select is saved with the project)

The settings are preserved at upgrade.

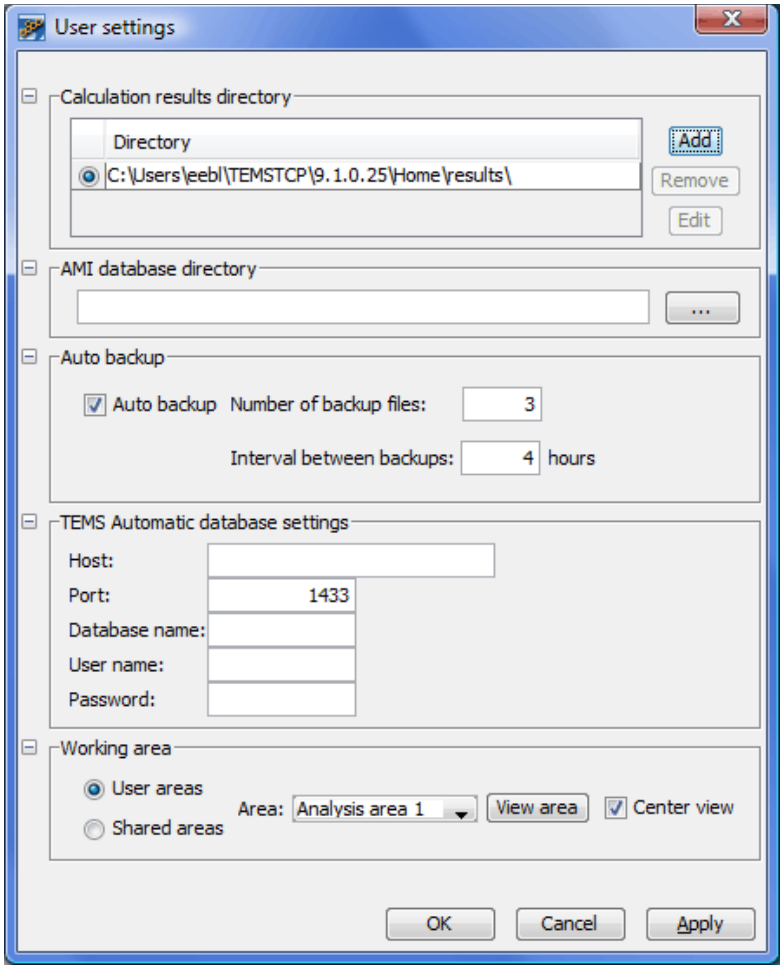
Define User Settings

Use this procedure to set your private parameters for the current, open project:

1. Select **File↗User settings**. The **User settings** window is displayed.
2. Select a **Calculation results directory**. You may add multiple paths to the list, but only select one directory at a time.
3. The rest of the settings are optional:
   - **AMI database directory**
   - **Auto backup** settings
   - **TEMS Automatic database settings** for ASMT or puncturing.
   - **Working area**, see Apply a Working Area on page 3-20

   See parameter descriptions in Fields on Window "User settings" on page 3-18.
4. Click **Apply** to start using the settings.
5. Click **OK** to save the settings and close the window.

6. The result might look as in the following example:



Fields on Window “User settings”

Calculation results directory	Directory where calculation results are stored, initially set to `C:\Users\<user id>\<TEMSTCP\<TEMS CellPlanner version>\Home\results\`. You can add other calculation results directories to choose from. The calculation results directory may be accessed by one user at a time.
AMI database directory	The directory where you store imported measurement data to use in ASMT or pathloss puncturing. Multiple simultaneous users may read the directory, but if any of those users modify the directory from Automatic Measurement Integration (AMI), other users can no longer access it.
Auto backup - Copies a loaded project to a backup file when saved for the first time since being loaded. The backup is repeated with the specified interval.	
	Auto backup - Activates the auto backup function of the project. Default = enabled.
	Number of backup files - The maximum number of backup files to keep. When the limit is reached, the oldest file is overwritten.
	Interval between backups - Number of hours between backups. Minimum: 1 hour.
TEMS Automatic database settings - Import information for measurements used by ASMT and pathloss puncturing	
	Host - The host name of the TEMS Automatic database server, for example 192.168.0.3 or DBSERVER
	Port - The port number for the database server, by default 1433. In most cases, it is unnecessary to change this setting.
	Database name - The name of the TEMS Automatic database within the SQL Server, such as *TADB*. This is the name displayed in the “Databases” folder in the SQL Server Enterprise Manager.
	Username - The TEMS Automatic database user account. The database access rights of this account should be at least corresponding to the role TEMS_Presentation_User.
	Password - The password for the user account. The password is stored on disk in encrypted form.

(continues on next page)

Fields on Window “User settings”, continued

Working area	Type of working area: • User areas - use a private area as working area • Shared areas (default) - lists shared areas stored with the project. This option is relevant only for shared projects stored on server. If you select this option for a private project, the same areas will appear as if you had selected “user areas”. Area - List of areas retrieved from the project, the source depends on your selection of User or shared area. The selected area will be used as the working area. No selected area means that all sites (passing any filter) will be loaded. Only areas defined in advance and stored with the project appear in the list of areas. View area - Displays selected area as a polygon in the map Center view - Centers the map around the working area

Auto-Back Up Project Files

You can configure TEMS CellPlanner to perform automatic backups of project files. With the auto backup option enabled, a loaded project is copied to a backup file when saved for the first time since being loaded. The backup copy is created before the project file is updated. The backup is repeated with a specified interval.

Important: Ensure to regularly back up your projects, and store the backup files on another media than your ordinary project files. You would otherwise lose your projects in case of a disk crash.

The name and location of the copied file is the same as the original file, except for *.backup.<date>* being inserted before the normal extension. For example, *myproject.n80* is copied to *myproject.backup.20080524.n80*.

Prerequisites

A project is opened.

Procedure

Do as follows to configure auto-backup of project files:

1. Select File↗User settings.
2. Select Auto backup.

3. Enter the maximum number of backup files to keep on disk before overwriting the oldest backup file.
4. Enter the number of hours between backups.
5. Click **Apply**.

The next time you save a project to file it is automatically copied to a backup file.

Restore Project File from Backup

If your project file is corrupt or not usable for any other reason, you can restore the project from a previous version of the file. This assumes that you have previously enabled Auto-Back Up Project Files on page 3-19.

Prerequisites

- You have access to a backed up project file.
- A project is opened.

Procedure

Do as follows to restore a project from a backed up project file:

1. Close the TEMS CellPlanner Client.
2. Rename the project file to be replaced by a backup file.
3. Copy the backup file to the original file, for example *myproject.backup.20080524.n80* to *myproject.n80*.
4. Open the TEMS CellPlanner Client and open the restored project file.

Apply a Working Area

As a complement to Filters you can apply a *working area* for a project. A working area is like a global filter, saved together with the project and applied to the project each time you open it.

Only the sites within the working area are fully loaded into memory when you open the project. Sites outside the working area are excluded from explorers and analysis windows, and displayed as *overview sites* (grayed out in the map display). Overview sites will though be loaded into memory when needed, for example due to being neighbors to analyzed cells within the working area, provided that the sites are still accessible. See special considerations in Save Workspace to File and Work Offline on page 15-24

The use of working areas is optional, but recommended for large projects stored on server, as you gain performance by reducing the number of sites to load from the

server. The performance impact of loading an overview site is minimal as only position and name are loaded.

You either select a *user area* or a *shared area* as a working area. The selected option (user area or shared area) is stored in your user settings. You select the actual area from a list of defined (user or shared) areas. The areas, and which area you select as working area, are stored as part of the project.

See also Use Filters Together with a Working Area on page 10-18.

Prerequisites

- A project is opened.
- The area to use as a working area is defined, see Define Map Area on page 9-36.

Procedure

Do as follows to define a working area:

1. Select **File↗User settings**.
2. Select **Auto backup**.

Check, Save and Close a Project

Your changes to a project must be saved as a project file or on a server to be kept persistently.

Use the following procedures to save and optionally close the project:

1. Check Project Consistency - recommended
2. Save Project
3. Close Project

Check Project Consistency

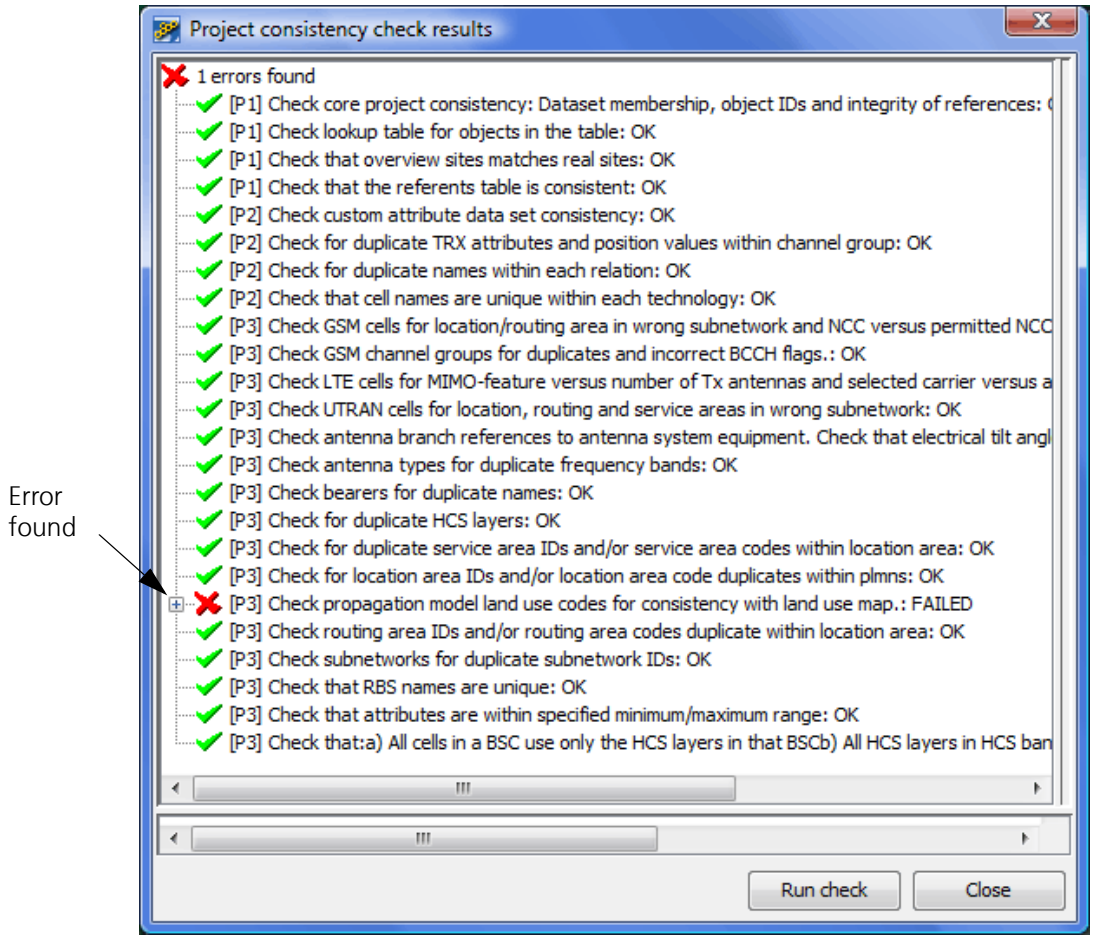
Use this procedure to check the consistency of a project. For example, the consistency check ensures that every GSM or WiMAX cell or every WCDMA or LTE sector, has at least one Rx/Tx antenna branch or one Tx and one Rx antenna branch.

You should check the consistency after importing data and before saving a project. The time required depends on the size of the project.

Important: The check might save you time as it prevents you from working with and saving corrupt projects. Consider this if being tempted to skip the check for time saving reasons.

Do as follows to check the consistency of an project:

1. Select **Utilities↗Project consistency check**. The consistency check is run and the **Project consistency check results** window appears as in the following example showing one error:


Error found
Project consistency check results
1 errors found
[P1] Check core project consistency: Dataset membership, object IDs and integrity of references:
[P1] Check lookup table for objects in the table: OK
[P1] Check that overview sites matches real sites: OK
[P1] Check that the referents table is consistent: OK
[P2] Check custom attribute data set consistency: OK
[P2] Check for duplicate TRX attributes and position values within channel group: OK
[P2] Check for duplicate names within each relation: OK
[P2] Check that cell names are unique within each technology: OK
[P3] Check GSM cells for location/routing area in wrong subnetwork and NCC versus permitted NCC
[P3] Check GSM channel groups for duplicates and incorrect BCCH flags.: OK
[P3] Check LTE cells for MIMO-feature versus number of Tx antennas and selected carrier versus a
[P3] Check UTRAN cells for location, routing and service areas in wrong subnetwork: OK
[P3] Check antenna branch references to antenna system equipment. Check that electrical tilt angl
[P3] Check antenna types for duplicate frequency bands: OK
[P3] Check bearers for duplicate names: OK
[P3] Check for duplicate HCS layers: OK
[P3] Check for duplicate service area IDs and/or service area codes within location area: OK
[P3] Check for location area IDs and/or location area code duplicates within plmns: OK
[P3] Check propagation model land use codes for consistency with land use map.: FAILED
[P3] Check routing area IDs and/or routing area codes duplicate within location area: OK
[P3] Check subnetworks for duplicate subnetwork IDs: OK
[P3] Check that RBS names are unique: OK
[P3] Check that attributes are within specified minimum/maximum range: OK
[P3] Check that:a) All cells in a BSC use only the HCS layers in that BSCb) All HCS layers in HCS ban
Run check
Close

2. Interpret the results and take actions.

   a. P1, P2 and P3 denotes the priority level of the check, and how severe it is to ignore the error. See Priority of Consistency Checks on page 3-24.

   b. If the consistency check fails with the error "Check that the referents table is consistent", you can repair this problem by exporting the project to an XML file, and importing the resulting XML file to a new project

   c. If the check shows other inconsistencies, correct them in explorers.

4. To repeat the consistency check, click **Run check**.

Priority of Consistency Checks

The **Project Consistency Check Results** window shows the priority of each check:

P1	Priority 1 checks are critical for data consistency. If the consistency check fails with a priority 1 check and you continue using the project, the data can be corrupt. One way to correct a priority 1 error is to export to XML and import the XML to a new project.
P2	Priority 2 checks are serious and recommended to be fixed so that the project functions can work correctly.
P3	Priority 3 checks affect only functions actually using the noted parameters/objects. If you ignore the warnings, you may experience strange behavior and results when trying to use functionality that depends on the parameters/objects

Save Project

You must save the project to not lose your changes in project settings.

Note: *Is your project stored on a server and not as a project file? Then follow instead the instructions in* Working with Projects on Server *on page 15-1.*

Do as follows to save the project file with its settings:

1. Recommended: Check Project Consistency before saving the project.
2. Select **File↗Save as**. The **Save** window appears, and the field **Files of type** displays the TEMS CellPlanner proprietary file format compatible with this TEMS CellPlanner version. Example: `TCP 9.1 project file (n91).`
3. Enter the project name in the **File name** field.
4. Click **Save**. The file is saved with the extension of the TEMS CellPlanner version appended, for example `.n91`.

As an alternative, if you save the project to the same file as the one used when opening the project, just select **File↗Save.**

Close Project

Use this procedure to close an open project:

1. Select **File↗Close**. A window prompts you to save changes to the project.
2. Click **Yes** to save the changes.

   Click **No** to close the project without saving changes.

   Click **Cancel** to keep the project open.

4
Licenses

This chapter describes the concepts of TEMS CellPlanner licenses, and how to manage the licenses once they are installed.

How to install licenses is described in the *TEMS CellPlanner Installation Guide*.

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About Licenses

To work with projects in TEMS CellPlanner Client, you need licenses for the radio technologies and other licensed features.

The license types, described in this chapter, are:

- pure stand-alone licenses
- pure network licenses
- checked-out licenses, that is, reserved network licenses used as stand-alone licenses

The license installation also depends on the license lock type, described in chapter *Installing Licenses* in the *TEMS CellPlanner Installation Guide*:

- USB dongle locked licenses, or
- PC locked licenses

Stand-Alone Licenses

TEMS CellPlanner Client users without connection to a license server need their own licenses installed on the local computer.

A stand-alone license file on the client PC contains the licenses for ordered features and TEMS CellPlanner versions. You load the stand-alone license file on your client PC, see chapter *Install TEMS CellPlanner Client* in the *TEMS CellPlanner Installation Guide*.

When you install TEMS CellPlanner Client you select use of stand-alone license.

When you open a project, the Required Licenses are requested from the license file on your client PC.

The advantage with stand-alone licenses is that you can easily work off-line with the TEMS CellPlanner Client. The disadvantage is that you must order a new license to work on other licensed features than currently loaded. For an administrator, it is also more tedious to administer the ordering and loading of distributed stand-alone licenses than centralizing the licenses on a license server.

Network Licenses

TEMS CellPlanner Client users working on-line over the same network can use *network licenses* installed on a license server computer. The license server must be accessible during the entire TEMS CellPlanner Client session.

A network license file on the license server contains the ordered number of licenses per TEMS CellPlanner version and feature. An administrator loads the network

license file on the license server, see chapter *Install TEMS CellPlanner License Server in* the *TEMS CellPlanner Installation Guide*.

When you install TEMS CellPlanner Client you specify the name or IP address of the license server.

When you open a project, the Required Licenses are requested from the license server. If any required license is unavailable, the TEMS CellPlanner Client terminates.

The advantage with network licenses is that centralized upgrade and administration of licenses becomes easier than upgrading licenses for many users with stand-alone licenses. The disadvantage is that you normally must be connected to the license server to use TEMS CellPlanner Client. You can though temporarily use network licenses off-line, see Check Out Licenses.

Checked-Out Licenses

If you normally use network licenses, but temporarily need to work disconnected from the license server (=stand-alone, off-line), you can reserve network licenses for off-line use up to 30 days. The reserved licenses are checked out to your computer and are no longer available for other users.

When you open a project, the Required Licenses are requested from the checked-out licenses.

You check out the licenses for a limited number of days, maximum 30 days. When the license expires you can no longer use it, just check it in.

When you no longer need to work off-line, you should check in your licenses to not block other users from using the licenses.

See Check Out Licenses and Check In Licenses.

Required Licenses

Licenses for all the radio technologies and licensed features selected in your Application Preferences are required to be able to open projects in TEMS CellPlanner Client.

Each required license is marked with a box in front of the feature name in the **Check out/in** window of the **License Management** utility.

Selecting Licenses

The procedures in this section describe how to select which licensed features to include when opening the TEMS CellPlanner client, and how to select a stand-alone or network license.

Select Licensed Features

When you open a project, licenses are requested for the radio technologies and other licensed features selected in your Application Preferences.

AMI & ASMT license

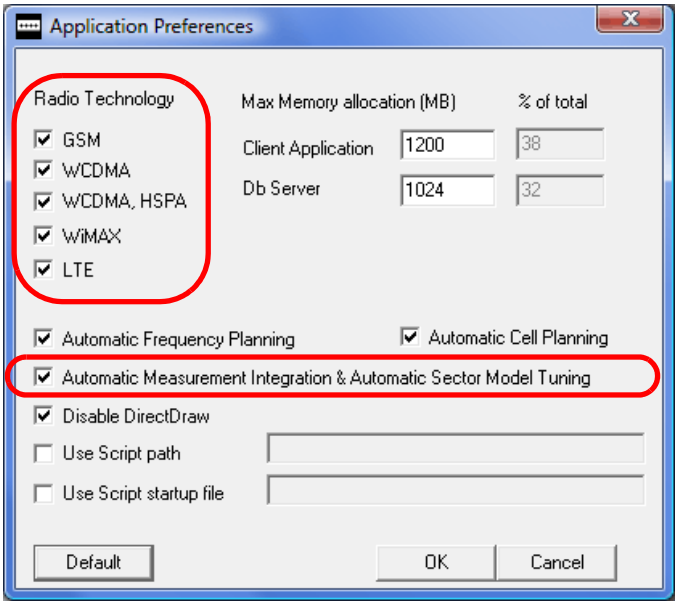
Automatic Measurement Integration (AMI) and Automatic Sector Model Tuning (ASMT) share the same license.

Prerequisites

TEMS CellPlanner is installed on the local computer.

Procedure

1. Select **Start↗Programs↗Ascom↗TEMS Products↗TEMS CellPlanner v.x.x↗Utilities↗Application Preferences.** The Application Preferences window is displayed.



2. Select or deselect radio technologies and other features. Note that Automatic Measurement Integration (AMI) and Automatic Sector Model Tuning (ASMT) share the same license.
3. Click **OK** to save the changes.

Application Preferences to Select Licensed Features

Radio Technology	The mobile technologies to use.
Automatic Frequency Planning	Enables use of the integrated Automatic Frequency Planning (AFP).
Automatic Cell Planning	Enables the use of the integrated Automatic Cell Planning (ACP).
Automatic Measurement Integration & Automatic Sector Model Tuning	Enables use of Automatic Measurement Integration (AMI) and Automatic Sector Model Tuning (ASMT).
Default	Sets defaults for parameter settings.

Select Use of Stand-Alone Licenses

To use Stand-Alone Licenses you must configure the TEMS CellPlanner Client to search for the licenses on your local computer.

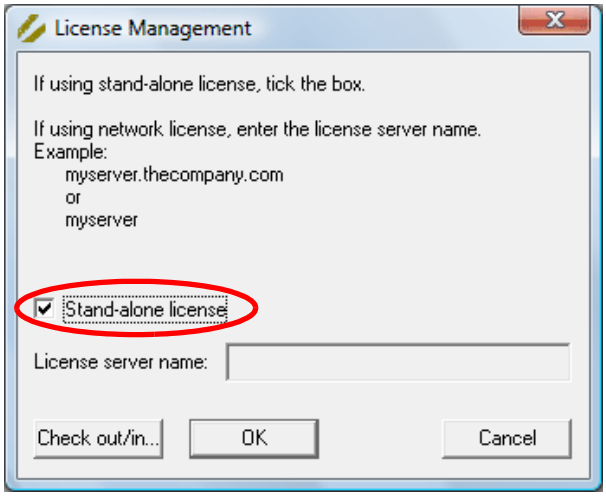
Note: *Do not use this procedure if you have checked-out licenses. Use of stand-alone license is automatically selected when you have checked out all* Required Licenses.

Prerequisites

A stand-alone license is installed on the local computer.

Procedure

1. From the Start menu, open **Programs↗Ascom↗TEMS Products↗TEMS CellPlanner v.x.x↗Utilities↗License Management.** The License Management window appears:



2. Select the Stand-alone license option. The server name field is disabled.
3. Click OK. If the stand-alone license is found on the local computer, the window is closed.

The next time you (re)start TEMS CellPlanner Client, you will use the stand-alone licenses.

Select Use Of Network Licenses

To use Network Licenses from a license server, you must configure the TEMS CellPlanner Client to search for licenses on a specified license server.

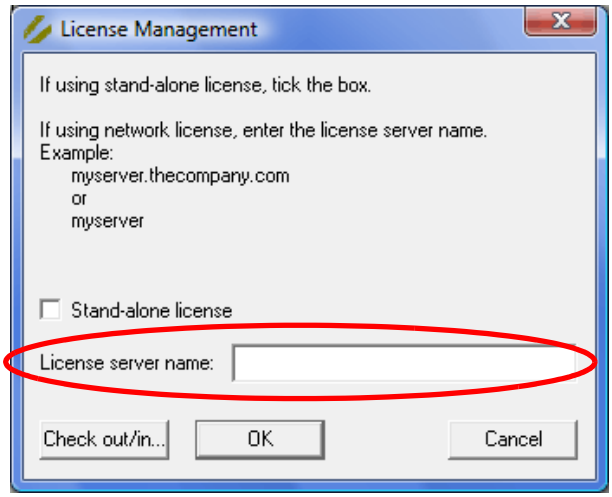
Note: *Do not use this procedure if you have checked-out licenses. If you want to use network licenses instead of your checked-out licenses, check in your licenses. When all licenses are checked in, use of network license is automatically selected.*

Prerequisites

You have access to the license server.

Procedure

1. From the Start menu, open **Programs↗Ascom↗TEMS Products↗TEMS CellPlanner v.x.x↗Utilities↗License Management**. The License Management window appears:



2. Clear the Stand-alone license option.
3. Enter the name or the IP address of the license server.
4. Click OK. The window is closed when the server is found.

All license requests from the TEMS CellPlanner Client are now directed to the license server.

Using Licenses Off-Line

Use the procedures to work off-line with network licenses checked out from a license server.

Check Out Licenses

Note: *This procedure is not relevant if you use a stand-alone license on your computer.*

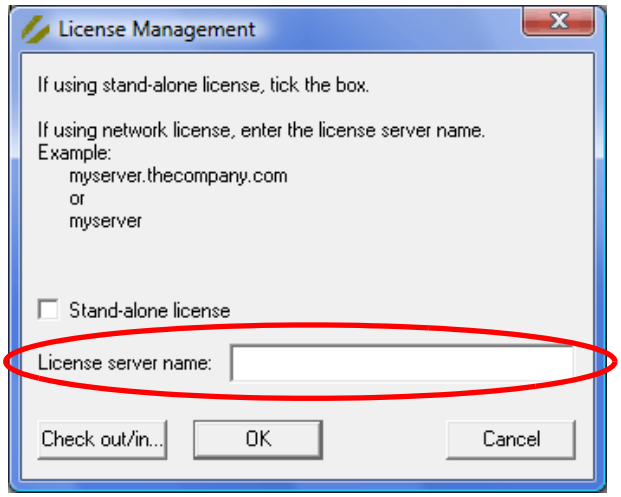
If you normally use network licenses but temporarily need to work off-line with TEMS CellPlanner Client, you can check out network licenses from the license server to your local computer. You can use the Checked-Out Licenses up to 30 days.

Prerequisites

You have access to the license server.

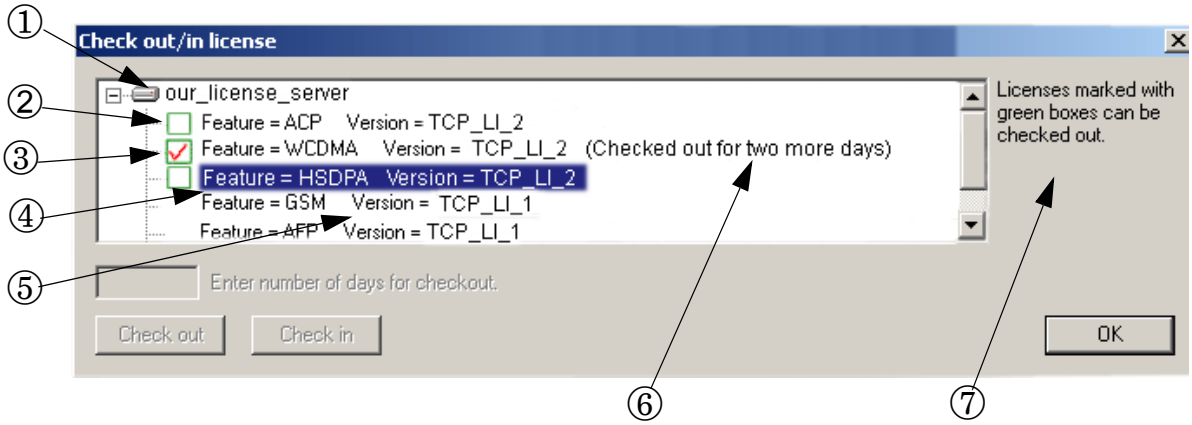
Procedure

1. From the **Start** menu, open **Programs↗Ascom↗TEMS Products↗TEMS CellPlanner v.x.x↗Utilities↗License Management**. The **License Management** window appears:



2. Clear the **Stand-alone license** option.
3. Enter the name or IP address of the license server.

4. Click **Check out/in**. The **Check out/in** window appears with a list of licenses to the left and a message pane to the right, as in the following example:



5. The messages tell the status of the licenses and gives guidance about what is possible or required to check out. See Fields on the "Check out/in license" Window on page 4-10.
6. From the feature licenses preceded by a box, ☐, select a license to check out by pointing at the feature and clicking the mouse button.
7. Enter number of days for check out.

   Advice A: *Check out the Required Licenses for more days than you plan to work off-line, to have some margin in case you are delayed with your off-line work.*

   Advice B: *Enter the same number of days for all licenses you check out at one occasion, to avoid sporadic expirations. Expiry of one license stops you from working with projects, as you need all licenses.*

8. Click **Check out**. The license is checked out to your local computer. A check mark, ☑, appears in the box in front of the checked-out license and the messages are updated.
9. Repeat Step 6 to Step 8 until you have checked out all Required Licenses. You should then get the message "All required licenses are checked out".
10. Click **OK** to close the window. Use of stand-alone license is automatically selected, which you can see by opening the **License Management** window.
11. Verify that it is possible to work disconnected from the license server:
    a. Disconnect the network cable
    b. (Re)start TEMS CellPlanner Client and check that a project can be opened properly.

Fields on the “Check out/in license” Window

①	The license server holding the network licenses.
②	Licenses marked with a box, ☐, are selected in your Application Preferences. You must check out all those licenses to be able to work off-line and open projects in TEMS CellPlanner Client.
③	Licenses with a check mark in a box, ☑, are checked out. Note: The boxes are read-only. You can not select licenses by entering a check mark in the box.
④	Highlighted license, selected for check out.
⑤	License of a TEMS CellPlanner version specific feature. Note: In this window, you can not see if licenses are available, just that they are loaded on the license server.
⑥	Expiry information of the license.
⑦	Messages about status of the licenses. See examples in Messages on the “Check out/in license” Window.
Number of days for checkout	The number of days you want to use this license off-line. Range: 1 - 30 days.
Check out	Checks out one license of the highlighted feature
Check in	Checks in one license of the highlighted feature
OK	Closes the window

Messages on the “Check out/in license” Window

Message	Explanation and Action
Licenses marked with green boxes can be checked out	Select marked feature for check out
No license for this TEMS CellPlanner version exists on this license server	None of the Required Licenses exist on this license server. The reason can be either of: • You have chosen the wrong license server • The license server is not updated with licenses for this TEMS CellPlanner version Action: Check the name of license server in the License Management window. If the name is correct, alert the administrator of the license server that licenses are missing.

Licenses not available on the license server: <list of features>	List of completely missing licenses of features or radio technologies. Action: Alert the administrator of the license server that licenses are missing. If licenses will not be installed, deselect these features from your Application Preferences.
<x> licenses remain to be checked out	You have not yet checked out all Required Licenses. Action: Check out all Required Licenses.
All required licenses are checked out	Your check out is complete.

Tip: To monitor how many licenses are available on the license server, run

```
C:\<Program Folder>\Ascom\TEMS Products\TEMS
CellPlanner v.x.x\Bin\WlmAdmin.exe
```

Check In Licenses

Note: This procedure is not relevant if you use a stand-alone license on your computer.

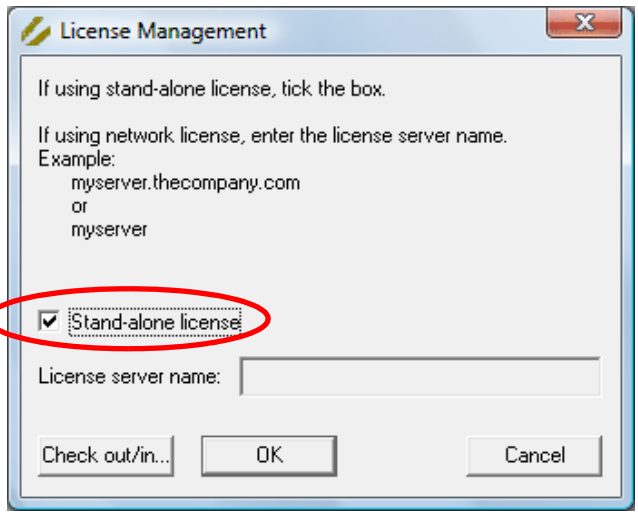
If you have Checked-Out Licenses and no longer need to work off-line, you should check them in to not block other users from using the licenses.

Prerequisites

You have access to the license server.

Procedure

1. From the **Start** menu, open **Programs↗Ascom↗TEMS Products↗**TEMS CellPlanner **v.x.x↗Utilities↗License Management**. The **License Management** window appears:



2. Ensure that the **Stand-alone license** option is selected.
3. Click **Check out/in**. The **Check out/in** window appears with a list of licenses to the left and a message pane to the right, see Fields on the "Check out/in license" Window on page 4-10.
4. Select a license to check in by pointing at the feature and clicking the mouse button.
5. Click **Check in**. The license is checked in from your local computer to the license server. The check mark is cleared in the box in front of the checked-in license, and the messages on the right side are updated.
6. Repeat Step 4 to Step 5 until all checked out licenses are checked in.
7. Click **OK** to close the window. Use of network license is automatically selected, which you can see if you open the **License Management** window.

Tip: To monitor how many licenses are available on the license server, run

```
C:\<Program Folder>\Ascom\TEMS Products\TEMS
CellPlanner v.x.x\Bin\WlmAdmin.exe
```

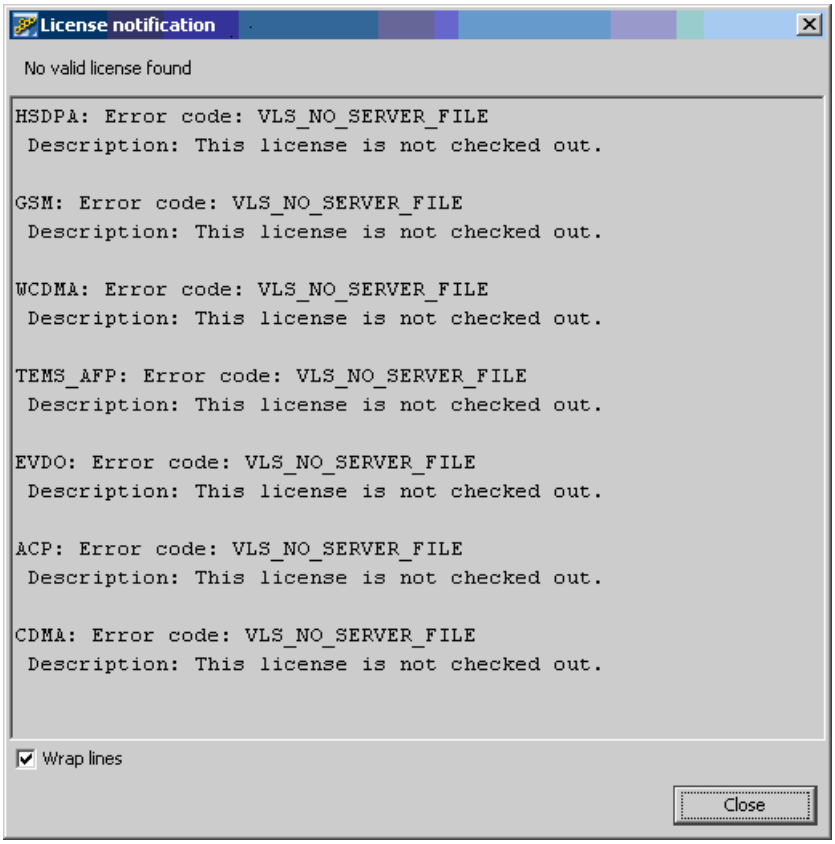
Release Expired Licenses

Note: This procedure is not relevant if you use a stand-alone license on your computer.

The checked-out licenses expire after the number of days chosen at check out. The expiry occurs in the license server as well as in your local computer.

In the license server the licenses simply become available for other users.

In your TEMS CellPlanner Client the expiry is more visible. If you open a project in TEMS CellPlanner Client using checked-out licences and any checked-out license has expired the License notification window is displayed as in the example below. The TEMS CellPlanner Client then halts.


License notification
No valid license found
HSDPA: Error code: VLS_NO_SERVER_FILE
Description: This license is not checked out.
GSM: Error code: VLS_NO_SERVER_FILE
Description: This license is not checked out.
WCDMA: Error code: VLS_NO_SERVER_FILE
Description: This license is not checked out.
TEMS_AFP: Error code: VLS_NO_SERVER_FILE
Description: This license is not checked out.
EVDO: Error code: VLS_NO_SERVER_FILE
Description: This license is not checked out.
ACP: Error code: VLS_NO_SERVER_FILE
Description: This license is not checked out.
CDMA: Error code: VLS_NO_SERVER_FILE
Description: This license is not checked out.
Wrap lines
Close

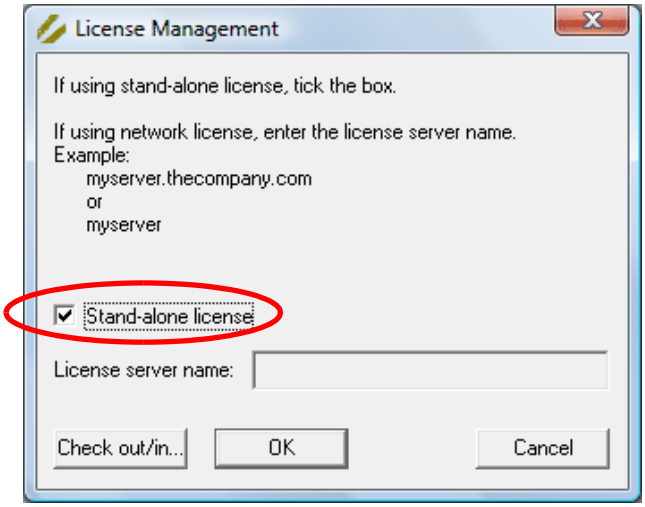
To be able to work with projects in the TEMS CellPlanner Client again, you have to release all checked-out licenses on your local computer by checking them in.

Prerequisites

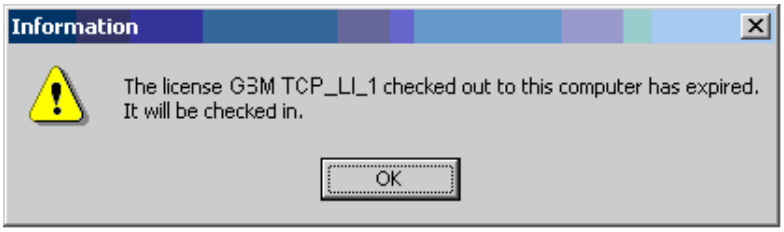
You have access to the license server.

Procedure

1. From the **Start** menu, open **Programs↗Ascom↗TEMS Products↗**TEMS CellPlanner **v.x.x↗Utilities↗License Management**. The **License Management** window appears:



2. Ensure that the **Stand-alone license** option is selected.
3. Click **Check out/in**. As at least one license has expired, another dialog than the **Check out/in** window appears, namely an **Information** window:



4. Click **OK**. The checked-out license in the **Information** window is released from you local computer and checked in on the license server.
5. Repeat Step 3 (window displayed automatically) to Step 4 until no more expired licenses remain to check in.
6. If all Required Licenses have been checked in, that is, you have no other licenses checked out, use of network license is automatically selected, which you can see if you open the **License Management** window.
7. If you still have unexpired licenses checked out, either check out the newly checked in licenses again or check in all Required Licenses. See Check Out Licenses and Check In Licenses.

Tip: To monitor how many licenses are available on the license server, run

```
C:\<Program Folder>\Ascom\TEMS Products\TEMS
CellPlanner v.x.x\Bin\WlmAdmin.exe
```

5
Equipment and System Data

This chapter describes how to define and configure radio technology independent equipment and system data for a project.

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About Explorers

Use the explorers and templates to manage elements of GSM, LTE, WCDMA, and WiMAX network elements.

Use these explorers to manage network elements in TEMS CellPlanner:

Explorer	Use it to...
Equipment explorer	Manage equipment types used in network plans
System explorer	Define systems and services for all network technologies
Template explorer	Manage templates for network equipment and services
RBS explorers	Manage the RBSs in a network plan
Site explorer	Add RBSs, antenna branches, and cells to sites
Network explorer	Manage networks and subnetworks

Sequence for Defining Equipment, Systems and Services

The recommended sequence for entering systems and equipment is:

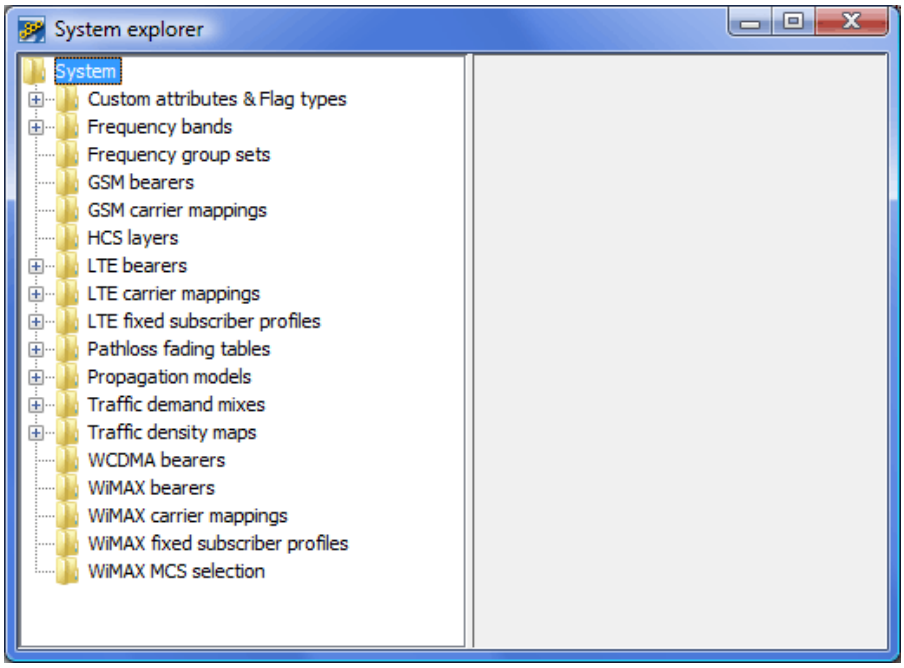
Explorer to Use	Sequence for Defining
System explorer	1. Frequency bands 2. Frequency groups 3. Carrier mappings 4. Propagation models 5. Pathloss fading tables 6. Traffic density maps 7. Traffic demand mixes 8. GSM / LTE / WCDMA / WiMAX bearers 9. GSM HCS layers 10. Custom attributes / flags
Equipment explorer	11. GSM / LTE / WCDMA / WiMAX RBS types 12. Antenna types 13. Terminal types 14. GSM BSC types 15. WCDMA RNC types 16. Feeder cable types (optional) 17. TMA types (optional)

Technology-Specific Systems and Services

Refer to the technology-specific modules of the user's guides for systems and services specific to GSM, LTE, WCDMA and WiMAX technologies.

About the System Explorer

Use the **System explorer** to define systems and services for all network technologies. The following example of the explorer shows the available systems and services:



Import System Data from Another Project

As an alternative to define new system data (or service), you can import it from another project. You may reuse any system data or service, for example frequency bands, bearers, custom attributes or flag types.

Prerequisites

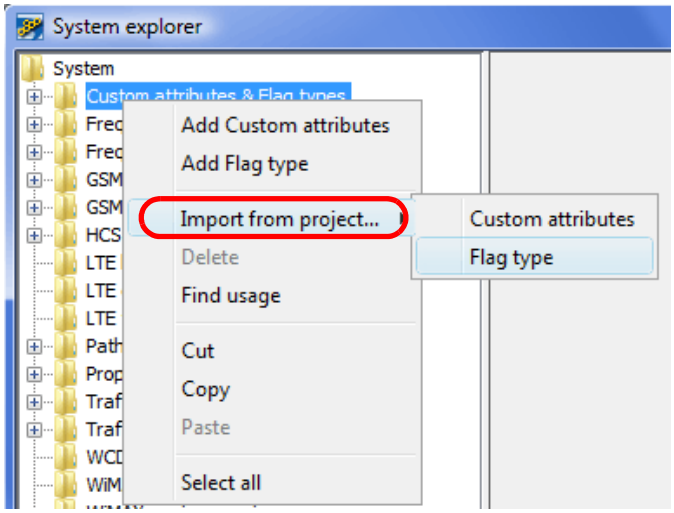
- A project is opened.
- The system data to import into the open project is defined in another project.
- Optional: To import from a default import project, you must first select that project in the Project Specific Settings on page 3-8.

Prerequisites

Do as follows to import system data or services from another project:

1. Select **Utilities↗System explorer.**

2. Right-click the item for which you want to import data and select **Import from project**, as in the following example where flag types will be imported:



3. If a default import project has been selected, that project is opened for import. Otherwise a file browser is opened, allowing you to manually select a project.
4. Select the data to import and click **OK**.

Custom Attributes and Flag Types

Some objects in your project can be tagged with your own text or graphical attributes to be shown in the plots.

See chapter Customizing Attributes for Sites, RBSs and Cells on page 6-1 for more information.

Frequency Bands

Most parameters of frequency bands defined in TEMS CellPlanner are common for all radio technologies, while some parameters are radio technology specific.

In this chapter you find procedures about how to set the radio technology independent frequency band parameters. Refer to the respective user guide for information about the radio technology specific parameters.

See also the *TEMS CellPlanner Common Features Technical Reference Manual* for examples and illustrations on frequency band configurations for all supported radio technologies.

Define Frequency Band

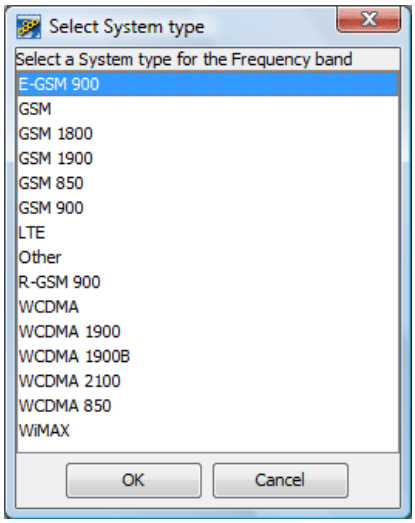
Use this procedure to add and configure a frequency band according to the limits assigned for your network plan.

Prerequisites

A project is opened.

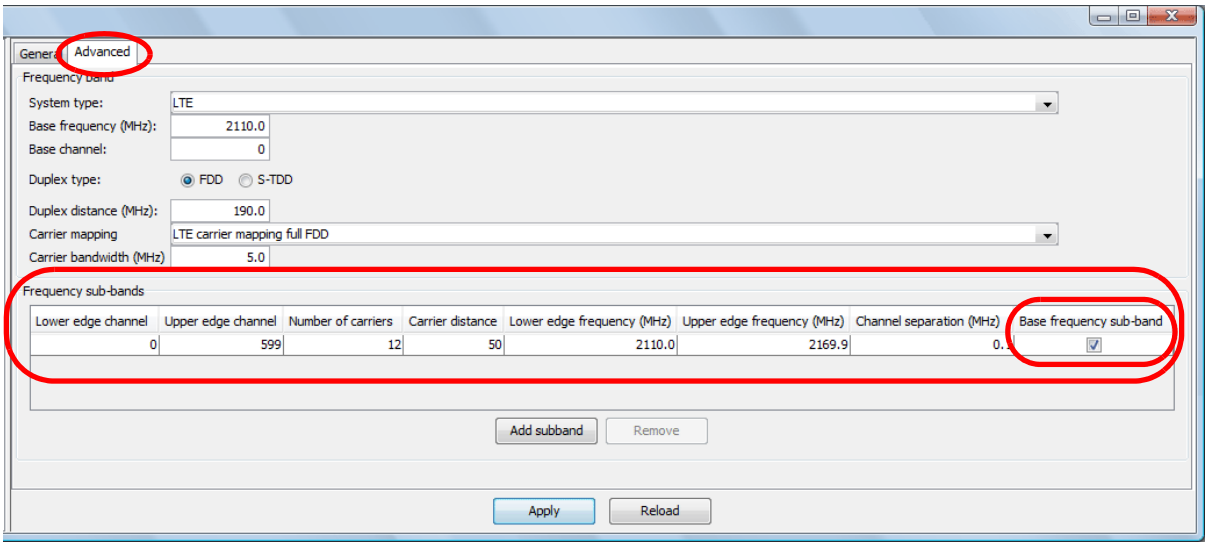
Procedure

1. Select **Utilities↗System explorer.**
2. Right-click the **Frequency Band** folder and select **Add Frequency band**. The **Select System type** window is displayed, showing the predefined combinations of radio access technology and frequency band:



3. Select desired system type and click **OK**.

4. Give the frequency band an appropriate **Name** and select the **Advanced** tab. The **Frequency band - Advanced** window is displayed. An initial base sub-band for the system type is created and displayed. For some system types, an additional sub-band is also created.
5. Configure the frequency band by entering **Base frequency**, **Base channel** and **Duplex type**. See parameter descriptions in Frequency Band Fields on Window "Frequency Band - Advanced".
6. Configure the **Frequency sub-band** parameters of the base sub-band as required: **Lower edge channel, Upper edge channel, Number of carriers, Carrier distance,** and **Channel separation**. The lower and upper edge frequency parameters are automatically updated. See parameter descriptions in Frequency Sub-band Fields on Window "Frequency Band - Advanced".
7. In the base sub-band row, select the **Base frequency subband** option.
8. The result might look as in the example below.



9. Note that some Frequency band parameters are radio technology (system type) specific. Modify any of those parameters if needed.
10. Click **Apply** to preserve the settings.
11. Optionally Define Sub-band for extra bandwidth.
12. Proceed with Step 4 in Select Carrier Channels.

Frequency Band Fields on Window "Frequency Band - Advanced"

System type	Indicates the radio technology of the frequency band.
Base frequency (MHz)	The base frequency for the frequency band. Identical to the Lower edge frequency of the base sub-band (with option Base frequency subband selected).
Base channel	The base channel mapped to the Base frequency. Identical to the Lower edge channel of the base sub-sub-band (with option Base frequency subband selected).
Duplex type	FDD or S-TDD. Default: FDD. S-TDD selectable for some radio technologies (system types).
Duplex distance (MHz)	The distance in MHz between uplink and downlink frequencies. Editable if FDD selected. 0 for S-TDD.

Define Sub-band

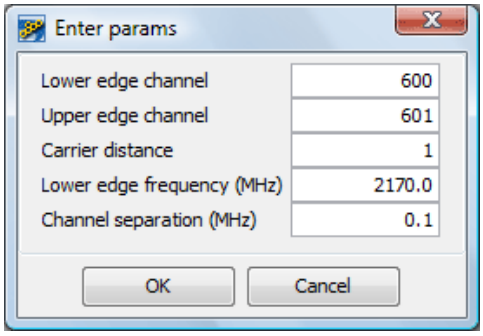
Use this procedure to add and configure sub-bands in addition to the base sub-band, according to the assigned limits for your network plan.

Prerequisite

A frequency band has been defined, see Define Frequency Band.

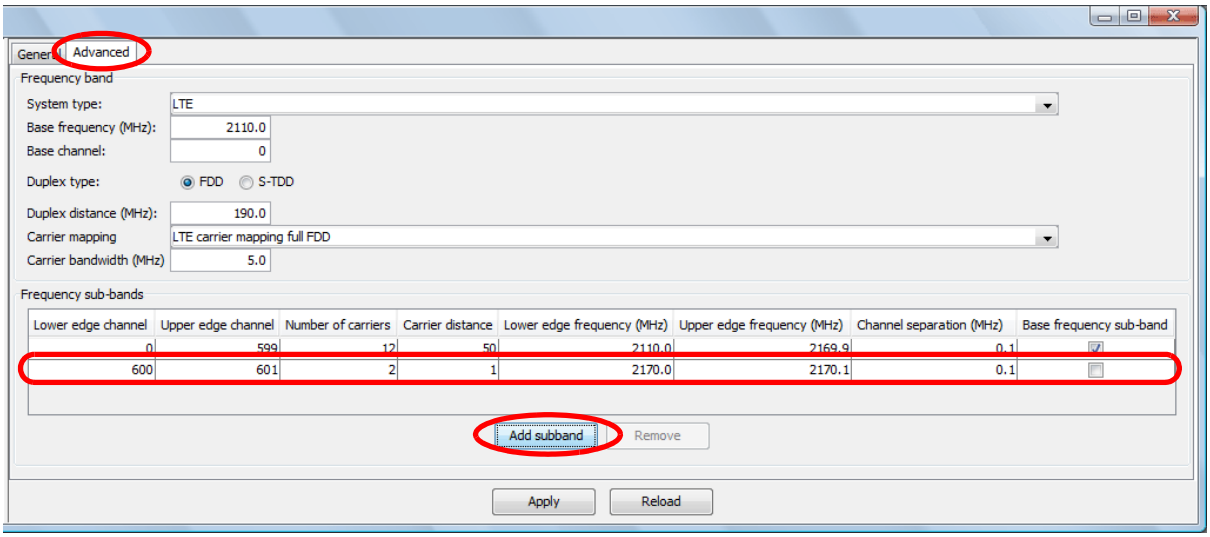
Procedure

1. Select Utilities↗System explorer.
2. Select the frequency band for which to add or modify sub-bands.
3. Select the Advanced tab. The Frequency Band - Advanced window is displayed.
4. To add a sub-band, click Add sub-band. A window with suggested sub-band parameters appears:



The sub-band parameters are described in Frequency Sub-band Fields on Window "Frequency Band - Advanced".

5. Modify the parameters as required and click **OK**. The new sub-band appears in the **Frequency band - Advanced** window:



6. Click **Apply** to preserve the sub-band settings. The carrier (xARFCN) lists in the **Frequency band - General** tab is updated to reflect the new sub-band configuration.
7. Proceed with Step 4 in Select Carrier Channels.

Frequency Sub-band Fields on Window "Frequency Band - Advanced"

Lower edge channel	The channel number delimiting the lower edge of the sub-band.
Upper edge channel	The channel number delimiting the upper edge of the sub-band.
Number of carriers	The number of sub-band channels possible to select as carriers in the **General** tab.
Carrier distance	The distance between channels (xARFCNs) possible to select as carriers in the **General** tab. Different sub-bands may have different carrier distances.
Lower edge frequency (MHz)	The DL lower edge frequency of the sub-band. Automatically updated when changing the other sub-band parameters.
Upper edge frequency (MHz)	The DL upper edge frequency of the sub-band. Automatically updated when changing the other sub-band parameters.
Channel separation (MHz)	Separation interval in MHz between channels.
Base frequency subband	Selected for the sub-band defined as base sub-band.
Add subband	Adds a sub-band to the frequency band.
Remove	Removes a selected sub-band from the frequency band.

Select Carrier Channels

Use this procedure to select the frequency band channels (xARFCNs) to use as carriers in cells.

Prerequisite

A frequency band is defined, see Define Frequency Band.

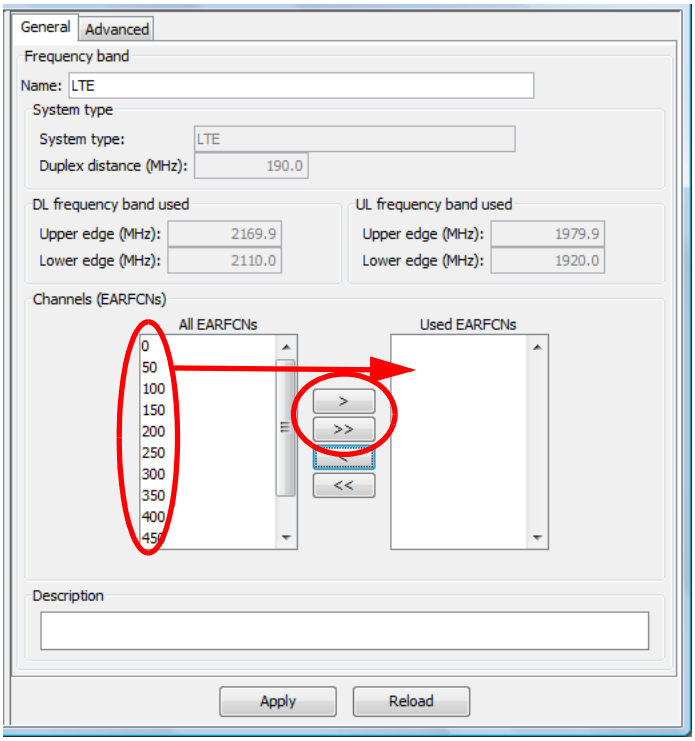
Procedure

1. Select **Utilities↗System explorer.**
2. Select the frequency band for which to add carriers.
3. Select the **General** tab. The **Frequency band - General** window appears. The frequency limit parameters are calculated from the corresponding parameters in the **Advanced** tab.

   See Fields on Window "Frequency Band - General".
4. Select channels to use as carriers from the **All.** list. Click **>>** to select all channels, or **>** to select specific channel. The selected channels are moved to

the **Used** list. The number and exact name of the lists vary with the radio technology (system type). The example below is valid for LTE.

Note: *Each channel you select is the mid-frequency of a carrier. You must consider the carrier bandwidth to select carriers such that they do not exceed the lower or upper edge of the frequency band.*



5. Click **Apply** to preserve the carrier selection.

Fields on Window "Frequency Band - General"

Name	Name of the frequency band. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Read-only parameters, set in the **Advanced** tab.	
System type	The radio technology for the frequency band
Duplex distance (MHz)	The distance in MHz between uplink and downlink frequencies.

DL frequency band used **UL frequency band used**	The **Lower edge (MHz)** and **Upper edge (MHz)** of the paired DL and UL frequency band, mapped according to the parameters **Lower edge frequency**, **Upper edge frequency** and **Duplex distance** in the **Advanced** tab. See *TEMS CellPlanner Common Features Technical Reference Manual* about how UL lower/upper edge values are calculated from configured DL settings.
Channels (xARFCNs)	
All ...	In this example called **All EARFCNSs**. A list of channels (carrier candidates) not yet selected as carriers. The number of carrier candidates and the distance between them are defined in the base sub-band settings, see Frequency Band Fields on Window "Frequency Band - Advanced".
Used ...	In this example called **Used EARFCNs**. A set of channels selected as carriers from the **All** ... list. The carriers included here can be selected as cell carriers in the cell configuration.
Description	Optional description of the frequency band.

Define Pathloss Fading Tables

Pathloss fading tables consist of fade margins for each land use category. Use this procedure to define pathloss fading tables to use in TEMS CellPlanner analysis functions.

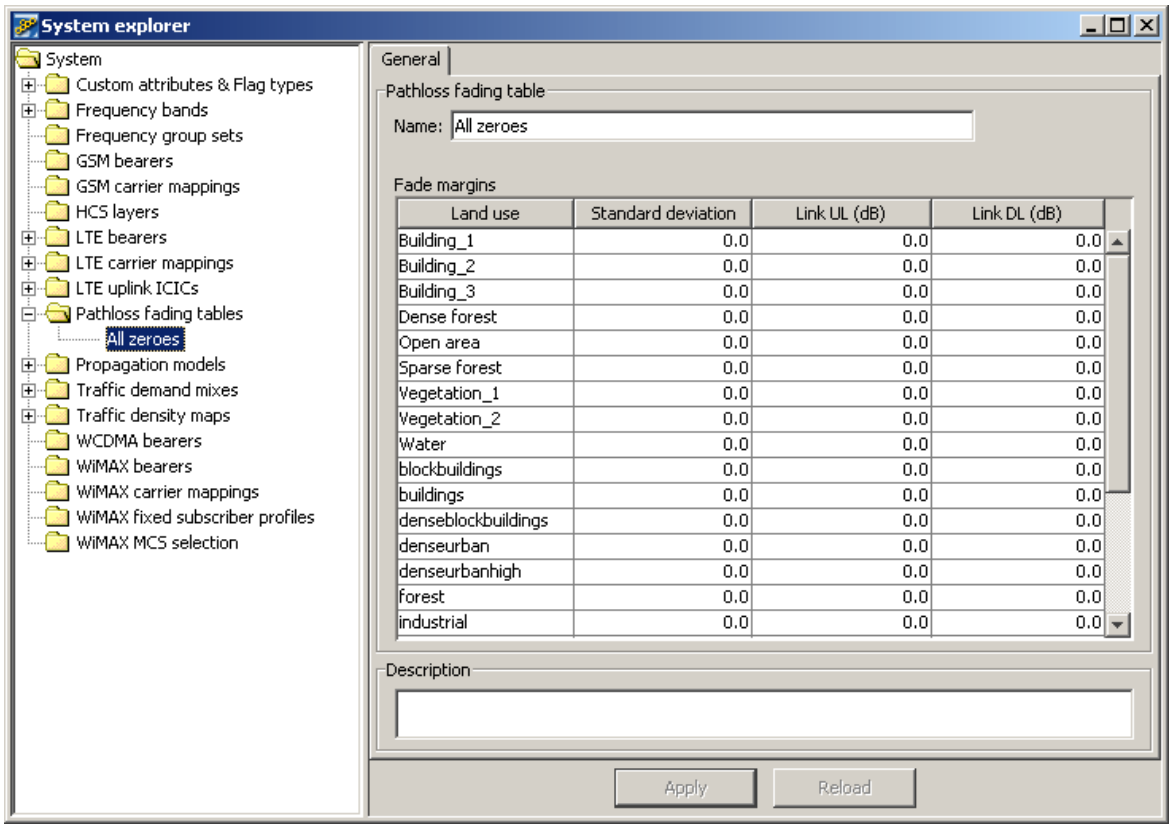
Definition: Fade Margin

A *fade margin* is a factor by which a particular signal fades, in addition to pathloss, when a subscriber is making a call from certain terrain.

Procedure

Follow these steps to add a pathloss fading table:

1. Select **Utilities↗System Explorer**.
2. Highlight **Pathloss fading tables**, right-click and select **Add Pathloss fading table** to display a list of land use categories and columns signifying the uplink and downlink fade margins.



3. Double click a cell to change it. Change all applicable entries, assigning values between 0 and 10.

4. Assign a name to the fading table to identify the table in the **Fading margin table** list in the **Algorithm parameters** window of the **WCDMA analysis** window.
5. Click **Apply** to preserve the pathloss fading table.

Fields on Window "Pathloss fading table"

Name	The name of the pathloss fading table. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Land use	Land use category of each fade margin.
Link UL (dB)	Uplink in dB for each fade margin.
Link DL (dB)	Downlink in dB for each fade margin.
Description	Description of the pathloss fading table

Propagation Models

RF propagation models require a set of mapping data and a set of continuous wave (CW) measurement data for modeling the RF environment, and tuning the model. This combination of these two kinds of data is called a *propagation model*.

TEMS CellPlanner supports the following propagation models:

- Ericsson 9999 model (macrocell model)
- Ericsson Urban propagation model (macrocell/microcell model)
- Okumura-Hata (OH) model
- Walfisch-Ikegami (WI) model

For more information about the propagation model parameters, see the "Algorithms" chapter in the *TEMS CellPlanner Common Features Technical Reference Manual*.

Each propagation model in TEMS CellPlanner has a table of land use correction factors, different for each frequency band. The land use correction factor table contains a diffraction loss value, in the unit [dB], for each land use code in a propagation model. The correction factor values should correspond to the additional loss that arises when the receiver is located within each land use code. Since a land use code loss is frequency-dependent, each land use code table applies only to a specific frequency band.

Define Ericsson 9999 Propagation Model

The Ericsson 9999 propagation model is recommended for rural coverage areas where the site-to-site distance is greater than 1000 meters. The antennas are placed above the rooftops (pure macrocell networks).

The Ericsson 9999 model calculates the expected pathloss for the path between the transmitting base station antenna and the receiving subscriber equipment. The model accounts for the terrain profile, a cross-section of the earth along the straight line between the transmitter and the receiver.

Prerequisites

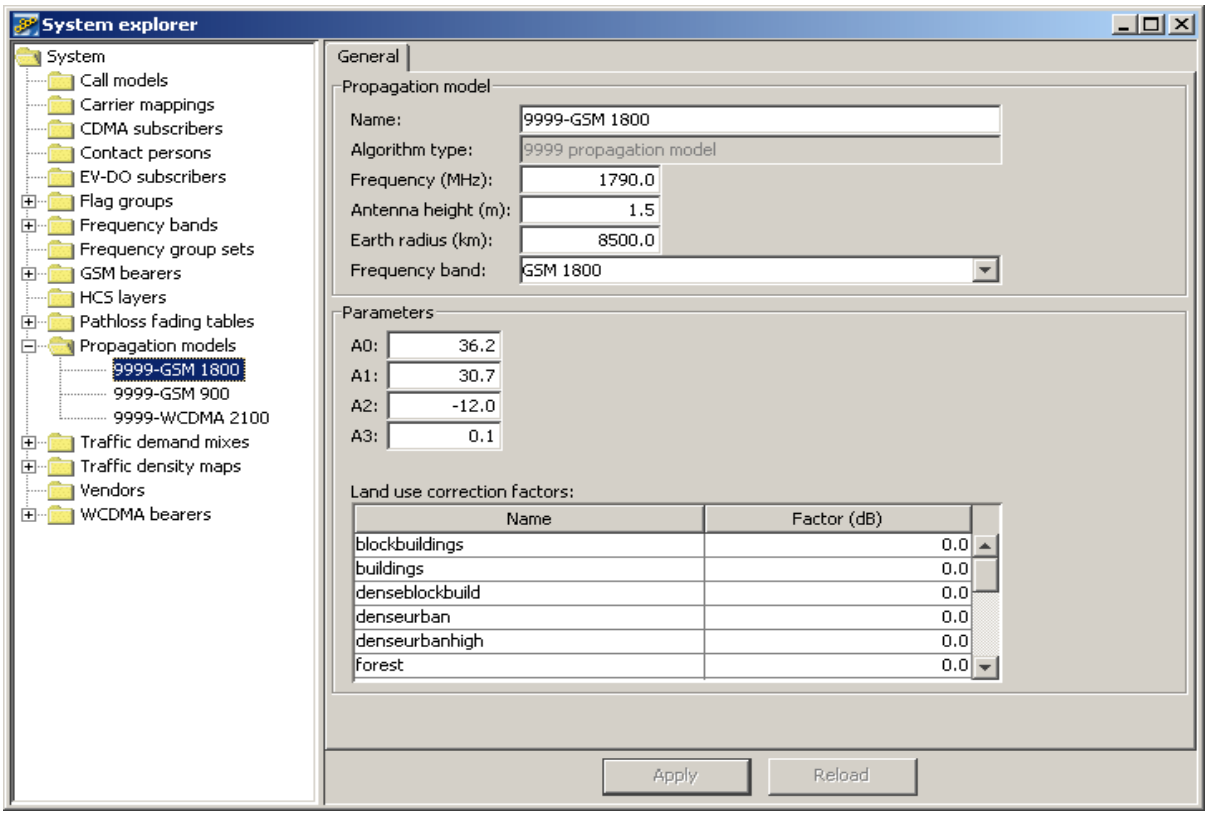
A landuse map layer must have been added in the **Project settings**, to obtain the landuse codes for the propagation model.

Procedure

Follow these steps to add an Ericsson 9999 propagation model:

1. Select **Utilities↗System Explorer.**
2. Right-click the **Propagation models folder** and select **Add Propagation Model Type**. The **Select Frequency band** window appears.

3. Select a pre-defined frequency band and click **OK**. The **Select algorithm** window appears.
4. Select the **9999 propagation model**. The **Propagation model** window appears:



5. Modify parameters as required, and click **Apply** to preserve the settings.

9999 Model Parameters on Window “Propagation model”

Name	The name of the propagation model. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Algorithm type	The algorithm used for the propagation model. Defaults to **9999** and cannot be changed.
Frequency (MHz)	Frequency used when tuning the propagation model.
Antenna height (m)	Height in meters of the terminal antenna. Range: 0 - 100. Default = 1.5 meters
Earth radius (km)	Radius of the earth in kilometers. Derived from settings in the map database. Default = 8500 (km)
Frequency band	The frequency band for the propagation model.
Parameters	Model tuning parameters: • A0 - Regulates the absolute level of the line and moves the line in parallel up or down. Default = 36.2 • A1 - Changes the slope of the line. Default = 30.7 • A2 - Regulates vertical distance between two propagation lines with different effective antenna heights. Default = -12.0 • A3 - Changes the slope of the line. Default = 0.1
Land use correction factors	Correction factors include the name, factor (dB), height (m), and separation.

Define Urban Propagation Model

The Ericsson Urban propagation model is used in populated areas requiring precise accuracy in prediction, as in microcell planning, and where the antennas are under the rooftops.

When you include a map database with building heights and exact positions in a project, the Urban propagation model uses land use heights and building raster data. When no building database is available, the Urban propagation model uses the land use heights and separation values you define for calculating pathloss.

The Ericsson Urban propagation model can handle map databases with a resolution of up to 1x1 m bin size. To get the best microcell planning results, a map database should also contain information about land use heights and building outlines.

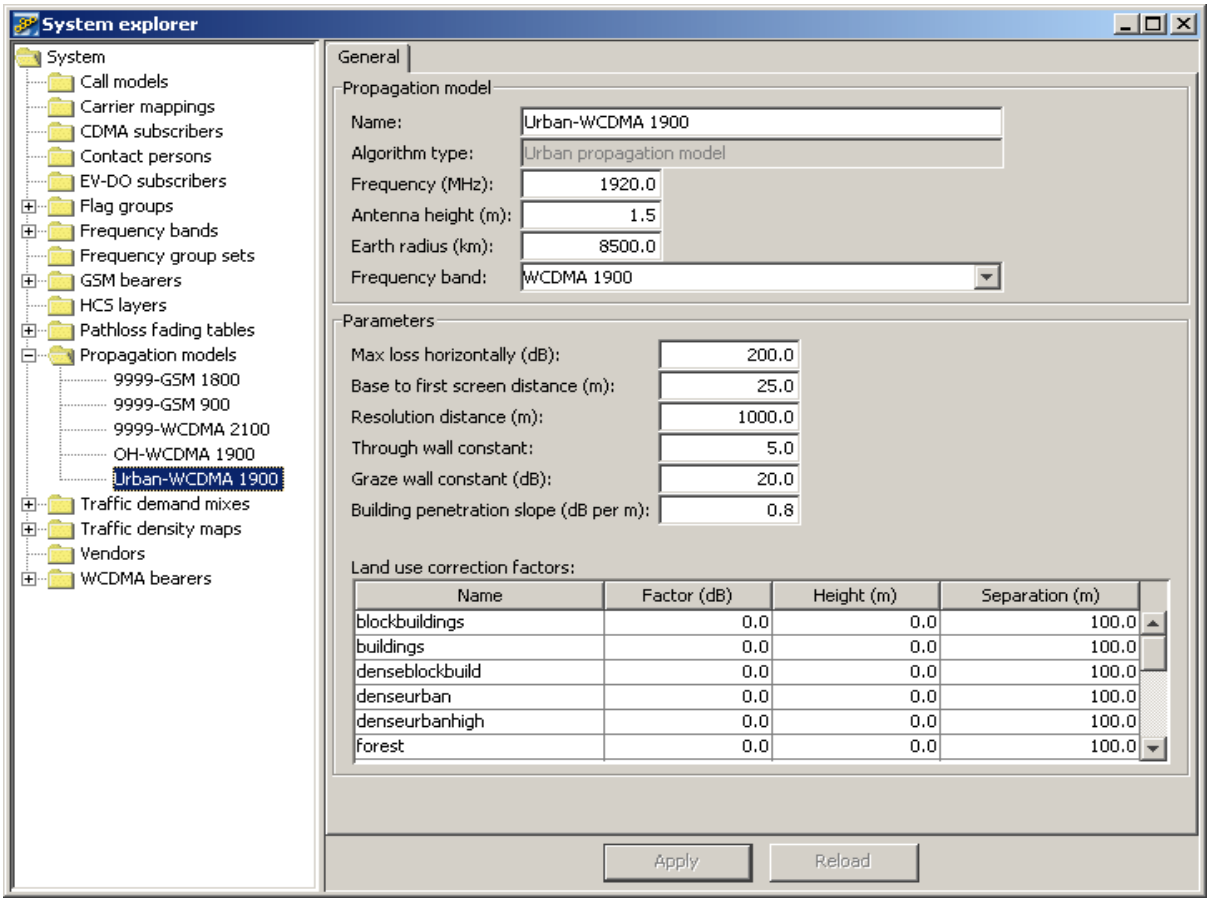
Prerequisites

A landuse map layer must have been added in the **Project settings**, to obtain the landuse codes for the propagation model.

Procedure

Follow these steps to define an Ericsson Urban propagation model:

1. Select **Utilities↗System Explorer.**
2. Right-click the **Propagation models folder** and select **Add Propagation Model Type**. The **Select Frequency band** window appears.
3. Select a predefined frequency band and click **OK**. The **Select algorithm** window appears.
4. Select the **Urban propagation model**. The **Propagation model** window appears:



5. Optional step: To turn off the microcell model, set the **Max Loss Horizontally** field to 0 (zero). Do this when you do not have building raster data for the project.
6. Modify parameters as required, and click **Apply** to preserve the settings.

Urban Model Parameters on Window "Propagation Models"

Name	The name of the propagation model. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Algorithm type	The algorithm used for the propagation model. Defaults to Urban and cannot be changed.
Frequency (MHz)	Frequency used when tuning the propagation model.
Antenna height (m)	Height in meters of the terminal antenna. Range: 0 - 100. Default = 1.5 meters
Earth radius (km)	Radius of the earth in kilometers. Derived from settings in the map database. Default = 8500 (km)
Frequency band	The frequency band for the propagation model.
Max loss horizontally (dB)	The Urban propagation model contains the microcell model. You can switch it off or on using this parameter. To turn off the microcell model, set this parameter to 0. Predictions made will use only the Half Screen Model of the Urban propagation model.
Base to first screen distance (m)	Determines the maximum pathloss to calculate for the microcell model. Setting this parameter to 0 turns off the microcell part of the model, and predictions made will take only the Half-Screen model of the Urban propagation model into consideration. Default = 25 meters
Resolution distance (m)	Inside the defined radius, the propagation model calculates pathloss for every bin. Outside the defined radius, the propagation model does not calculate very bin and instead interpolates results. The larger the value, the longer the time required for calculating pathloss. Default = 1 km, depending on prediction radius.
Through wall constant	The value for building penetration loss through the external wall, assuming that the radio wave penetrates the wall at a right angle. Default = 5 dB
Graze wall constant (dB)	The value for the signal penetrating the external wall with a grazing angle. Default = 20 dB
Building penetration slope (dB per m)	The value for the rate at which the signal decreases inside a building. Default = 0.8 dB per meter
Land use correction factors	Correction factors include the name, factor (dB), height (m), and separation.

Define Okumura-Hata Propagation Model

Use this procedure to define an Okumura-Hata propagation model.

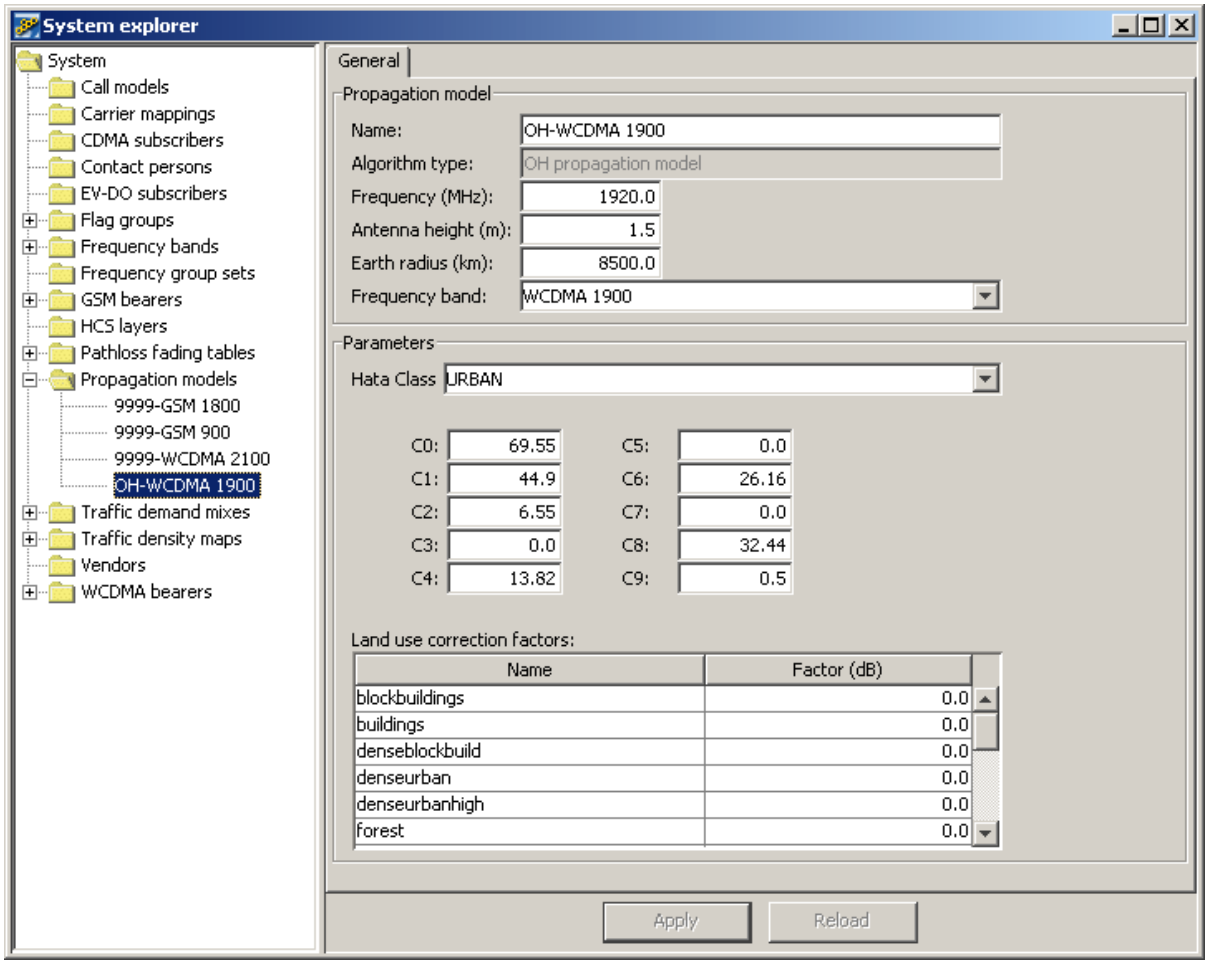
Prerequisites

A landuse map layer must have been added in the **Project settings**, to obtain the landuse codes for the propagation model.

Procedure

Follow these steps to add an Okumura-Hata propagation model:

1. Select **Utilities↗System Explorer.**
2. Right-click the **Propagation models folder** and select **Add Propagation Model Type**. The **Select Frequency band** window appears.
3. Select a predefined frequency band and click **OK**. The **Select algorithm** window appears.
4. Select the **Okumura-Hata propagation model**. The **Propagation model** window appears:



5. Modify parameters as required, and click **Apply** to preserve the information.

Okumura-Hata Parameters on Window "Propagation models"

Name	The name of the propagation model. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Algorithm type	The algorithm used for the propagation model. Defaults to **OH** and cannot be changed.
Frequency (MHz)	Frequency used when tuning the propagation model.
Antenna height (m)	Height in meters of the terminal antenna. Range: 0 - 100. Default = 1.5 meters
Earth radius (km)	Radius of the earth in kilometers. Derived from settings in the map database. Default = 8500 (km)
Frequency band	The frequency band for the propagation model.
Hata class	Class of service for the Okumura-Hata propagation model. Options are: • Urban • Suburban • Rural • Cost-Urban • Cost-Rural
C0 - C9	Parameter settings for the class of service.
Land use correction factors	Correction factors include the name and factor (dB)

Define Walfisch-Ikegami (WI) Propagation Model

Use this procedure to define a Walfisch-Ikegami (WI) propagation model.

Prerequisites

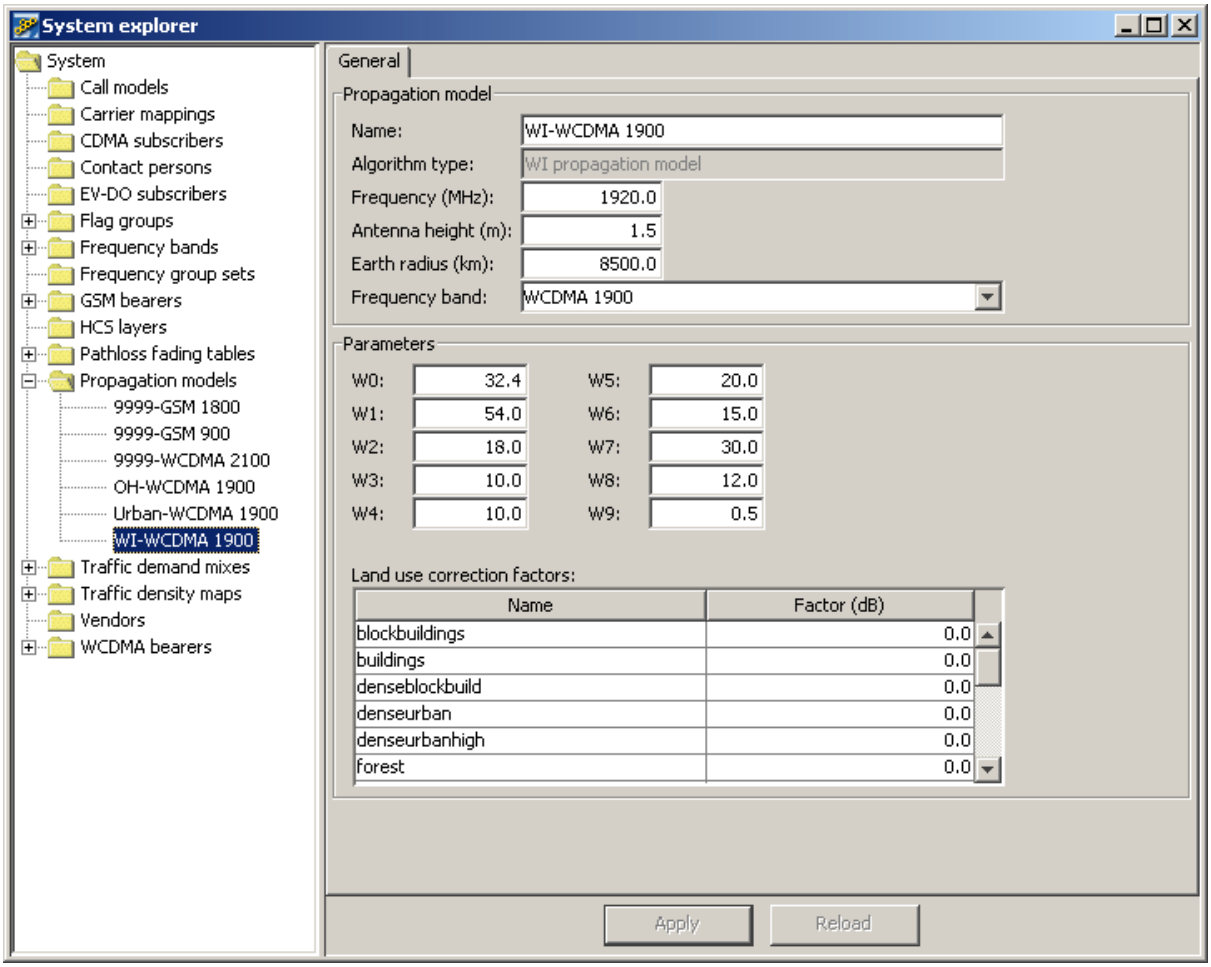
A landuse map layer must have been added in the **Project settings**, to obtain the landuse codes for the propagation model.

Procedure

Follow these steps to add a Walfisch-Ikegami (WI) propagation model:

1. Select **Utilities↗System Explorer.**
2. Right-click the **Propagation models folder** and select **Add Propagation Model Type**. The **Select Frequency band** window appears.

3. Select a predefined frequency band and click **OK**. The **Select algorithm** window appears.
4. Select the **Walfisch-Ikegami propagation model**. The **Propagation model** window appears:



5. Modify parameters as required, and click **Apply** to preserve the settings.

Walfisch-Ikegami Parameters on Window “Propagation models”

Name	The name of the propagation model. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Algorithm type	The algorithm used for the propagation model. Defaults to **WI** and cannot be changed.
Frequency (MHz)	Frequency used when tuning the propagation model.
Antenna height (m)	Height in meters of the terminal antenna. Range: 0 - 100. Default = 1.5 meters
Earth radius (km)	Radius of the earth in kilometers. Derived from settings in the map database. Default = 8500 (km)
Frequency band	The frequency band for the propagation model.
Parameters W0 - W9	Parameters correspond to these functions: • W0 - Free space pathloss correction • W1, W2 - Multiscreen pathloss correction • W3, W4, W5 - Rooftop to street path correction • W6, W7, W8 - Coefficients that cannot be changed • W9 - Terrain loss correction
Land use correction factors	Correction factors include the name and factor (dB)

Traffic Demands

The traffic in a network is distributed according to a certain pattern, in TEMS CellPlanner named a *traffic demand mix*. This mix is one of the inputs to the traffic performance and interference analysis.

The traffic demand from a certain bearer (service) depends on the terminals using the service and the geographic distribution of its subscribers.

The traffic demands are included in a traffic demand mix, which is one of the inputs to the traffic performance and interference analysis.

Read more on this topic in chapter *Traffic Modeling* in the *TEMS CellPlanner Common Features Technical Reference Manual*.

Define Traffic Demand Mix

To obtain realistic analysis results you need to define a traffic demand mix reflecting the live network as close as possible to the real traffic in the network.

Preparations for Defining Traffic Demands

Prior to configuring the traffic demand mix you should learn the fundamentals about traffic modeling and traffic demands, see the *TEMS CellPlanner Common Features Technical Reference Manual*.

You also need the following information about your network:

- Which services will be used? These are the bearers you define.
- Which type of terminals will there be?
- Which terminals support certain services?

For each bearer (service) you then need to estimate the following:

- How much will each terminal type supporting the bearer contribute to the traffic density, estimated in percents?
  - Will the subscriber density be uniformly distributed, or different for various land use categories? Count only simultaneously active users as subscribers.
  - If the first case is most appropriate, you have a *uniform* traffic demand. You then need to estimate the average subscriber density in the entire network, irrespective of geographical distribution.
  - If the latter case is most appropriate, you have a *non-uniform* traffic demand. You then need to estimate the subscriber density per land use category.

Prerequisites

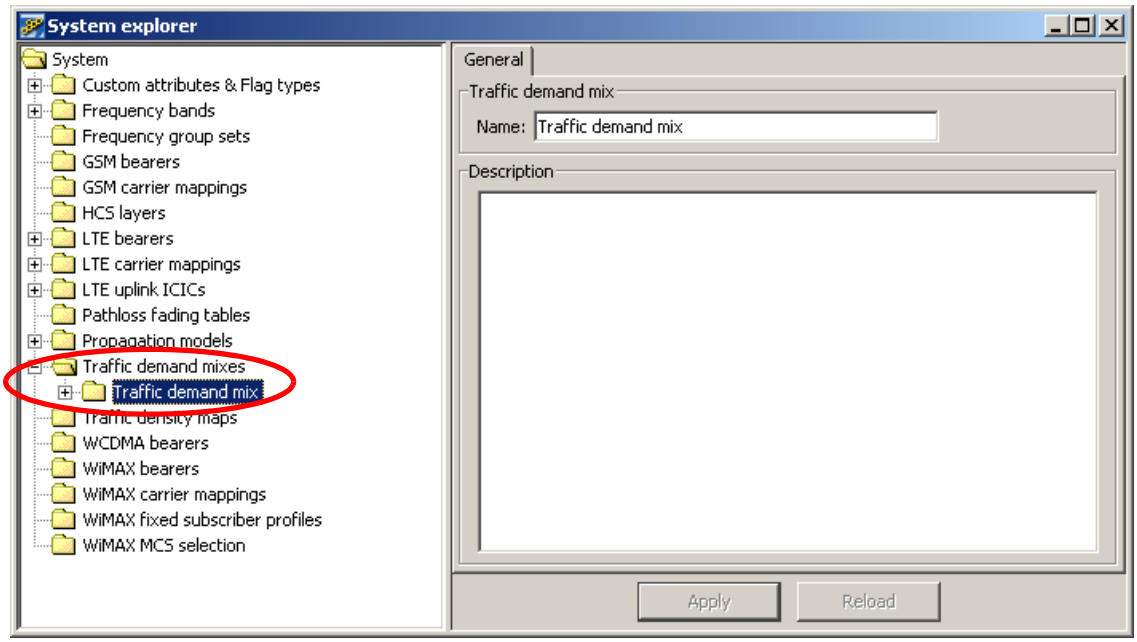
Before you define a traffic demand mix you must ensure the following:

- Do Preparations for Defining Traffic Demands
- A project is opened.

Procedure

Use this procedure to define a traffic demand mix, to later be filled with traffic demands contributing to the mix:

1. Select **Utilities↗System Explorer.**
2. Right-click the **Traffic demand mix folder** and select **Add Traffic demand mix**. An initially empty traffic demand object is added under the traffic demand mix, and the **Traffic demand mix** window appears:



3. Enter a descriptive **Name**.
4. Optionally add a **Description.**
5. Click **Apply** to preserve the traffic demand mix.

Fields on Window "Traffic demand mix"

Name	Name of the traffic demand mix. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Description	Description of the traffic demand mix.

Define Traffic Demand

To obtain realistic analysis results you need to define a traffic demand mix with traffic demands reflecting the live network as close as possible to the real traffic in the network.

Prerequisites

Before you define a traffic demand you must ensure the following:

- Do Preparations for Defining Traffic Demands on page 5-25
- The traffic demand mix to host the traffic demand is defined, see Define Traffic Demand Mix on page 5-25.
- The bearer for the traffic demand is defined.
- The terminal types to include in the traffic demand are defined and support the bearer.
- If the traffic demand is non-uniform, you must first define the subscriber density per land use category, see Define Traffic Density Maps on page 5-30.

Procedure

Follow these steps to add a traffic demand:

1. Select **Utilities↗System explorer.**
2. Select a traffic demand mix from the **Traffic demand mixes** folder.
3. a) To create a new traffic demand, right-click the **Traffic demand mix** folder and select **Add Traffic demand** from the menu.

   b) To modify an existing traffic demand, select it in the **Traffic demand mix** folder.

   In both cases the **Traffic demand -**window appears.
4. Give the traffic demand an appropriate **Name**.
5. Select the **Bearer** to associate with the traffic demand. The terminals supporting the bearer appear in the **Terminal distribution** list.
6. Enter the estimated **Load** contribution from the different terminals using this service.The sum of the load values must sum up to 100%.
7. The subsequent configuration depends on whether the subscriber density is uniform (A) or varies over the planning area (B).

   A) If the geographical distribution of subscribers using this service (bearer) is the same everywhere in the analysis area, for all bins and all land use categories, select option **Uniform demand**.

   B) If the geographical distribution of subscribers varies with the land use categories, clear option **Uniform demand** and select the appropriate **Traffic density map**.

8. Scale the traffic density as follows:

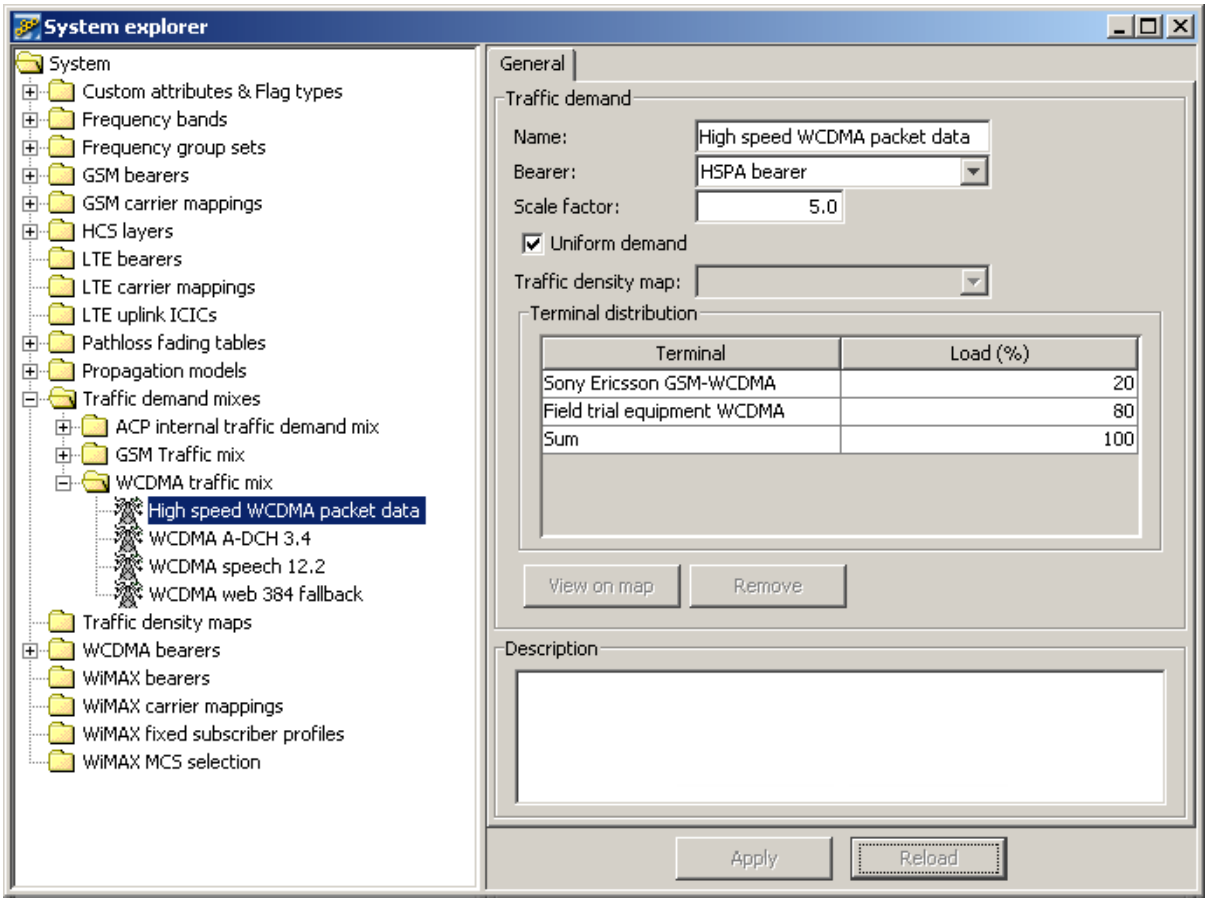
A) In the case of **Uniform demand**, the subscriber density equals 1 subscriber/km^2. multiplied by the **Scale factor**. See Example of Uniform Traffic Demand on page 5-28.

B) In the case of land use category dependent demand, the subscriber density for a specific land use category equals the number of subscribers/km^2 for that category multiplied by the **Scale factor**. The number of subscribers/km^2 is defined per land use category in the **Traffic density map**. See Example of Non-Uniform Traffic Demand on page 5-29.

9. Click **Apply** to preserve the traffic demand.

Example of Uniform Traffic Demand

The example below illustrates a traffic demand for a packet bearer. The traffic density is 5 subscribers/km^2 hence the scale factor is set to 5. The traffic demand from this bearer is thus 5 kbps/km^2.

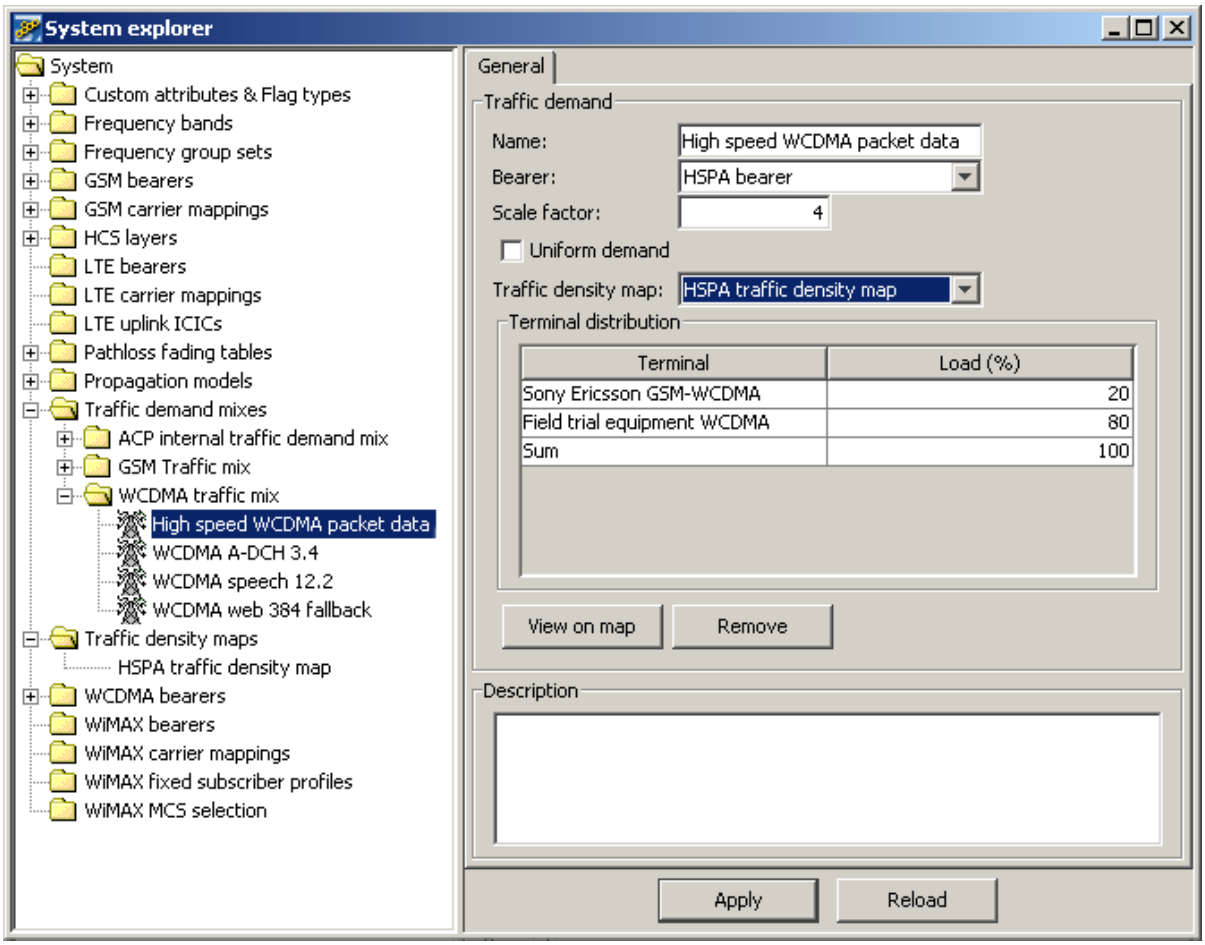


Example of Non-Uniform Traffic Demand

The example below illustrates a traffic demand for a packet bearer where the geographical distribution of subscribers is defined in a traffic density map as follows:

- 0.5 subscriber/km^2 in dense urban area
- 0.25 subscriber/km^2 in open area
- 0.15 subscriber/km^2 in village area
- 0.1 subscriber/km^2 in sea area

These numbers just tell the distribution of subscribers. You then need to multiply with a scale factor to obtain the estimated traffic density, still per land use category. In the example the scale factor is set to 4, as the estimated density is 2 subscribers/km^2 in dense urban area, 1 in open area, and so forth:



Fields on Window “Traffic demand”

Name	Name of the traffic demand. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Bearer	The bearer (service) for the traffic demand. Unsymmetrical load, that is, different load in DL and UL, is defined by configuring different DL and UL bitrates for the bearer.
Uniform demand	With uniform demand, the subscriber density is the same everywhere in the analysis area, for all bins and all land use categories. The subscriber density will equal to 1 subscriber/ km^2 multiplied by the **Scale factor**. Select either this option or a **Traffic density map**.
Traffic density map	Geographical subscriber distribution per land use category, used for this traffic demand. Selectable only if option **Uniform demand** is cleared.
Scale factor	The value to multiply with the basic subscriber density. Defined differently depending on whether it scales uniform or non-uniform traffic. The unit of the scale factor is radio technology and service dependent. See detailed description and examples in chapter *Traffic Modeling* in the *TEMS CellPlanner Common Features Technical Reference Manual*.
Terminal distribution	A list of terminal types with a traffic load contribution from each terminal type. The list shows only the terminals supporting the bearer of the traffic demand. The total load must sum up to 100%.
View on map	Displays the traffic demand in its own map layer. Selectable only if a **Traffic density map** is selected.
Remove	Removes the traffic demand from the map layer.
Description	Description of the traffic demand.

Define Traffic Density Maps

Use this procedure to define a traffic density maps to include in a traffic demand, see Define Traffic Demand on page 5-27.

Prerequisites

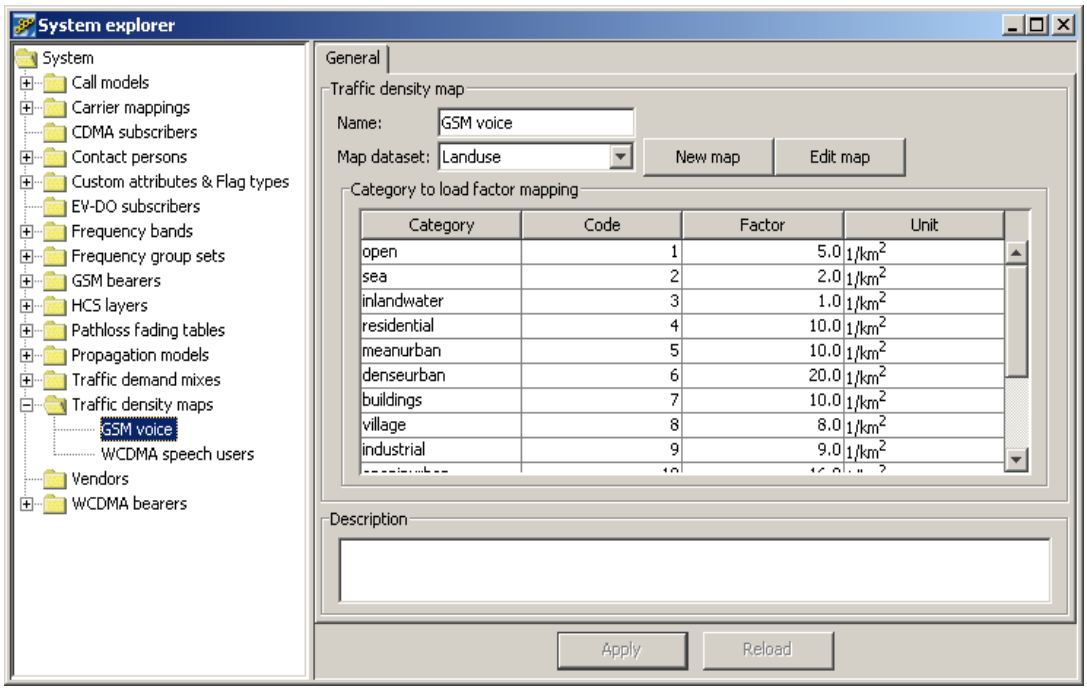
You have access to a land use map database.

Procedure

Follow these steps to define a traffic density map:

1. Select **Utilities↗System explorer.**

2. Right-click the **Traffic density maps** folder and select **Add Traffic Density Map** from the menu. The **Select a Map database** window is displayed.
3. Select a land use database and click **OK**. The **Traffic density map** window is displayed.
4. Enter a descriptive **Name**.
5. For all land use categories relevant for the traffic demand **Factor** column.
6. Click **Apply** to preserve the traffic density map. The result might look as in the following example:



Fields on Window “Traffic density map”

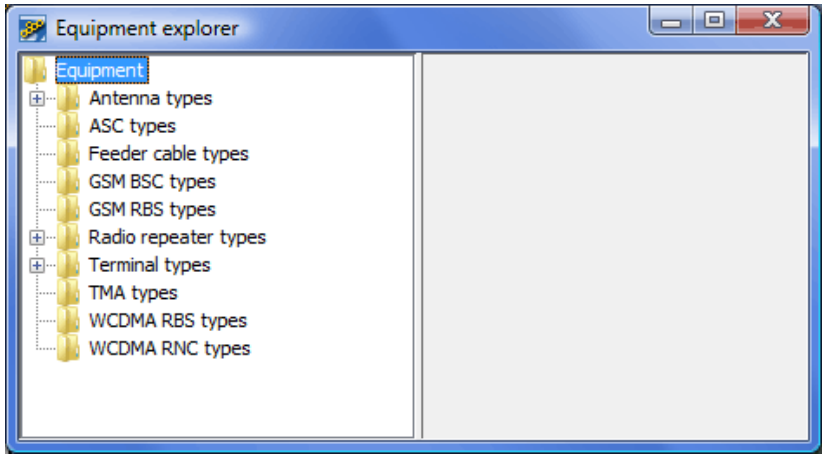
Name	Name of the traffic density map. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Map database	Name of the map database including the land use categories of interest
New map	Selects a new map database for the traffic density map
Edit map	Starts the map editor to edit the selected map database
Factor	The subscriber density defined per land use category. Expressed in subscribers/km2.

Unit	The unit of the *subscriber density* in a traffic density map is [number of subscribers/km2]. The final *traffic density* is calculated from the **Factor** parameters, the bearer (service) settings for the traffic demand, and the **Scale factor.** See Define Traffic Demand.
Description	Description of the traffic density map.

About the Equipment Explorer

Use the **Equipment explorer** to manage equipment types for a network plan. You can add, modify, or delete equipment using the right-mouse menus available in the explorer.

The example below shows the various equipment types managed from the **Equipment explorer**:



Technology-Specific Equipment

Refer to the technology-specific modules of the user's guides for equipment specific to GSM, LTE, WCDMA and WiMAX technologies.

Import Equipment Types from Another Project

As an alternative to define new equipment types, you can import it from another project. You may reuse any equipment types, for example terminal types or antenna types.

Prerequisites

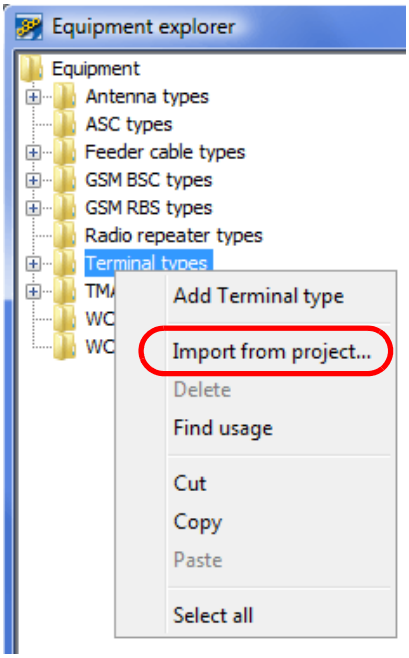
- A project is opened.
- The equipment types to import into the open project is defined in another project.
- Optional: To import from a default import project, you must first select that project in the Project Specific Settings on page 3-8.

Procedure

Do as follows to import equipment types from another project:

1. Select **Utilities↗Equipment explorer.**

2. Right-click the type of equipment for which you want to import data and select **Import from project**, as in the following example where terminal types will be imported:



3. If a default import project has been selected, that project is opened for import. Otherwise a file browser is opened, allowing you to manually select a project.
4. Select the equipment type to import and click **OK**.

Antenna Types

The recommended method to include antenna types in your network plan is to import them from antenna files, see Import EET/Planet 2.x Antennas on page 18-8.

As an alternative you may manually Define Antenna Types.

About Antenna Types

Each cell (or sector) has an antenna supporting the carriers of the cell's (or sector's) frequency band. The antenna is of a certain antenna type valid for antenna bands with antenna vertical lobes. An antenna band is valid for one or more frequency bands. An antenna vertical lobe represents the antenna lobe in the vertical plane for a given electrical downtilt angle.

Each radio propagation model assigns additional loss to antennas due to the site antenna viewed from a bin with a certain azimuth and elevation. The propagation model usually builds a three-dimensional pattern based on the vertical and horizontal patterns. Each radio propagation model may build its own pattern.

The downtilt of an antenna may be fixed, manually adjustable, or remotely controlled. These tilting capabilities are defined as *electrical tilt type* (FET, MET or RET) in the antenna type.

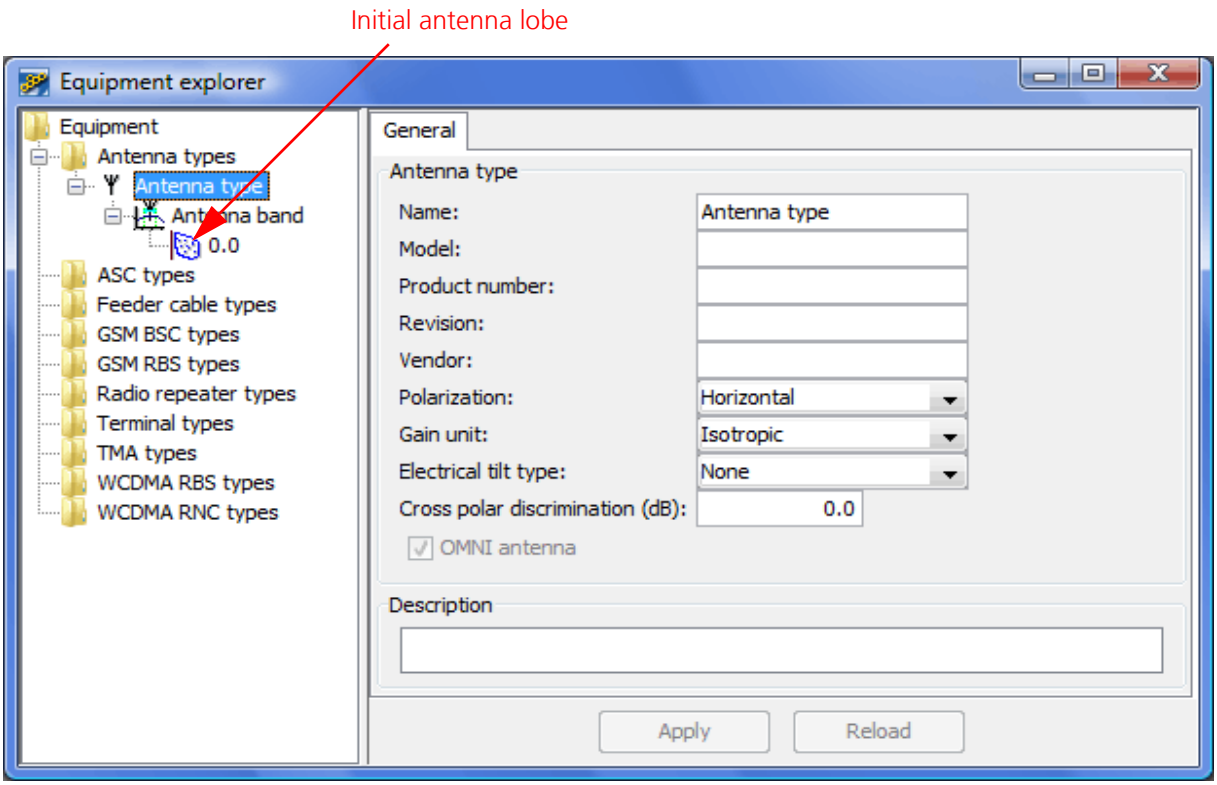
Define Antenna Types

Use this procedure to define an antenna type for any radio technology.

Procedure

Follow these steps to define antenna types:

1. Select **Utilities↗Equipment explorer**.
2. Right-click the **Antenna types** folder and select **Add Antenna Type**.
3. Select a frequency band and click **OK**. An antenna type object with a sub-object **Antenna band** with an initial 0° antenna lobe are created and displayed in the browser tree, and the **Antenna type** window appears as in the following example:



4. Enter a **Name** for the antenna type.
5. Configure Antenna Bands including antenna lobes with patterns.
6. Modify other parameters as required and click **Apply** to preserve the settings.

Fields on Window “Antenna type”

Name	Name of the antenna type. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Model	Model of the antenna type
Product number	Vendor’s product number of the antenna type
Product revision	Vendor’s product revision number of the antenna type
Vendor	Vendor name. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Polarization	The polarization of the antenna, horizontal or vertical. Default = Horizontal.
Gain unit	Type of gain unit used by the antenna
Electrical tilt type	The type of electrical downtilt for the antenna. • FET = Fixed electrical tilt. Standard range 0°, 2° and 6° • MET = Manually adjustable tilt. Tilt range 0° - FET angle. • RET = Remote electrical tilt. Valid only for UMTS. • None
Cross polar discrimination (dB)	The isolation between different polarizations in a cross-polarized antenna. Range 0 - 100. Default = 0.
Antenna type	The type of antenna
Description	Optional description of the antenna type.

Configure Antenna Bands

An antenna band may be defined for more than one frequency band as an antenna can distinguish between the radio wave propagation characteristics of each band.

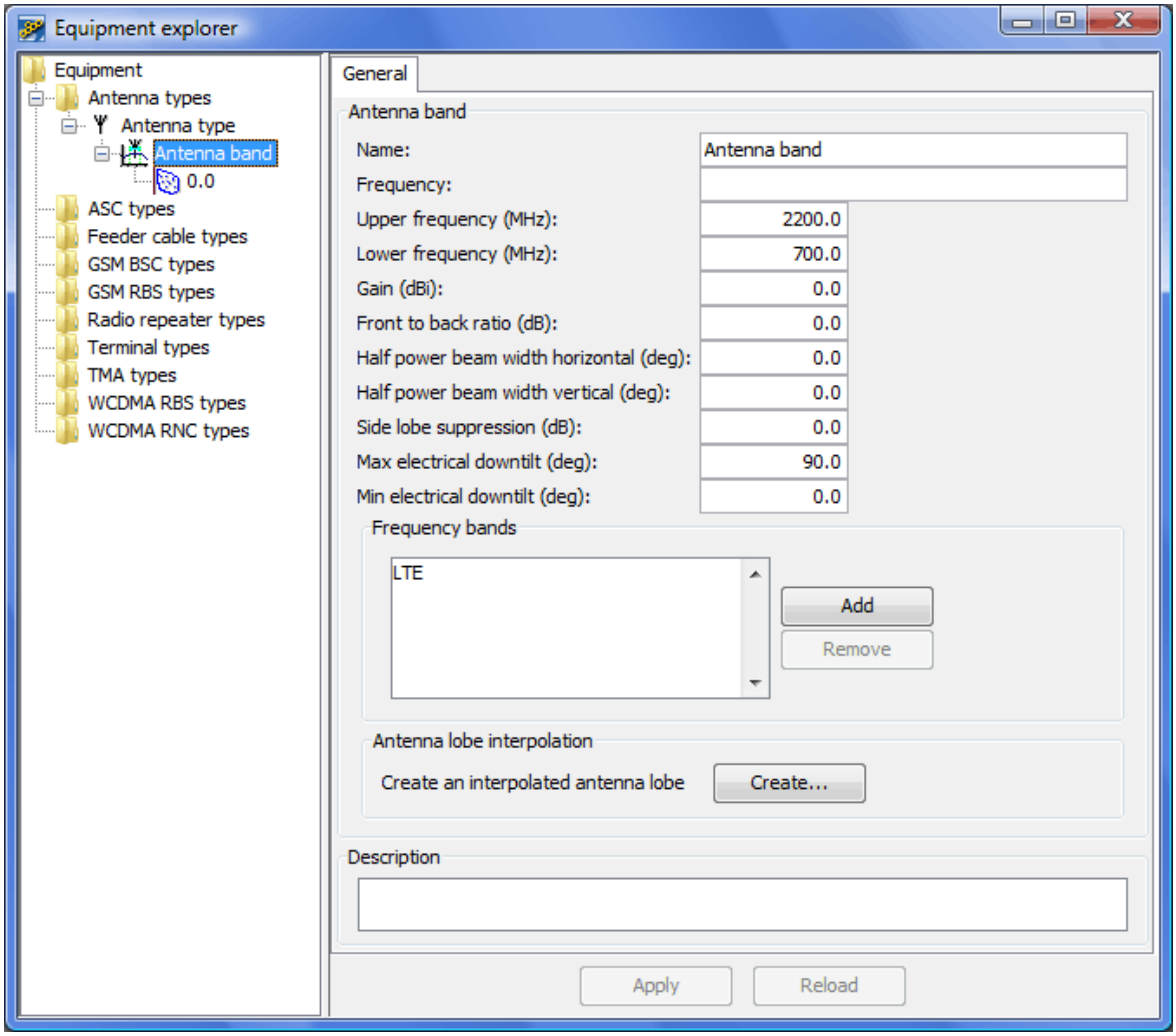
Prerequisites

The Antenna type window is opened, see Define Antenna Types on page 5-36.

Procedure

Follow these steps to add an antenna band to a defined antenna type:

1. Right-click an antenna type and select **Add antenna band** from the menu
   The **Antenna band** window is displayed as in the following example:



2. Modify parameters as required, see Fields on Window "Antenna band" on page 5-39.
3. Click **Apply** to preserve the antenna band information.

Fields on Window "Antenna band"

Name	Name of the antenna band. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Frequency	Frequency used by the antenna band
Upper frequency (MHz)	The upper frequency range of the antenna band. Range 400 - 2200. Default = 2200.
Lower frequency (MHz)	The lower frequency range of the antenna band. Range 400 - 2200. Default = 400.
Gain (dBI)	The gain of the insertion signal relative to a dipole or to an isotropic antenna. Range 0 - 100. Default = 0.
Front to back ratio (dB)	The ratio of the gain in the front main lobe to the gain in the back lobe. Range 0 - 100. Default = 0.
Half power beam width horizontal (deg)	The angle in the horizontal plane between the main lobe and the point when the antenna gain is reduced by 3 dB. Range 0 - 180. Default = 0.
Half power beam width vertical (deg)	The angle in the vertical plane between the main lobe and the point when the antenna gain is reduced by 3 dB. Range 0 - 180. Default = 0.
Side lobe suppression	The gain difference between the main lobe and the first side lobe. Range 0 - 100. Default = 0.
Max electrical downtilt (deg)	Maximum electrical downtilt in degrees. Range -90 to 90. Default = 90.0.
Min electrical downtilt (deg)	Minimum electrical downtilt in degrees. Range: -90 to 90. Default = 0.
Frequency bands	Frequency bands used by the antenna. An antenna band allows an antenna to use more than one frequency band because the antenna band distinguishes between the radio wave propagation characteristics of each band.
Add	Adds frequency band(s) to the antenna
Remove	Removes frequency band(s) from the antenna
Create an interpolated antenna lobe	Creates an interpolated antenna lobe based on the measured patterns of the other antenna lobe(s) of the antenna. If measured antenna lobe patterns are available, they should be used instead. See Create Interpolated Antenna Lobe on page 5-42.
Description	Description of the antenna.

Define Antenna Lobes

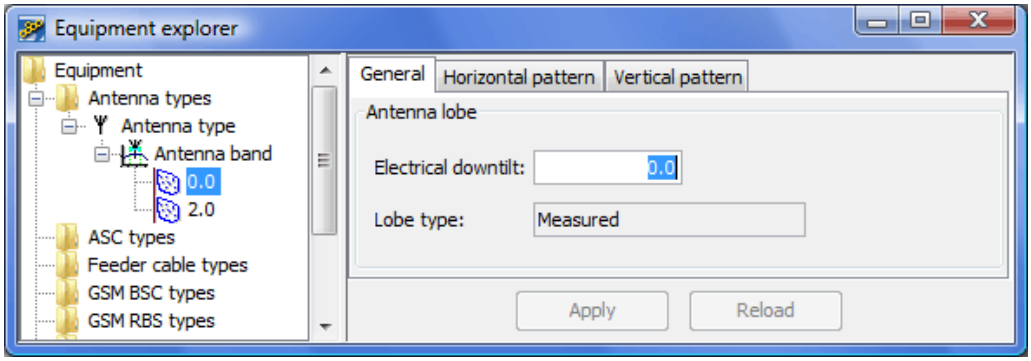
Antenna lobe definition uses three windows for general antenna lobe information and the horizontal and vertical patterns.

Prerequisites

The Antenna band window is opened, see Configure Antenna Bands on page 5-38.

Procedure

1. Select the antenna band where an antenna lobe shall be added or modified.
2. To create an antenna lobe, right-click on the antenna band and select **Add antenna lobe**. An antenna lobe is created and the **Antenna lobe** window appears, as in the following example.



3. Set the desired electrical downtilt in degrees.
4. Define Antenna Patterns and optionally Create Interpolated Antenna Lobes.
5. Click **Apply** to preserve the settings.

Field on Window "Antenna lobe"

Electrical downtilt	Electrical downtilt in degrees of the antenna lobe.
Lobe type	Read-only. Either of Measured or Interpolated. Manually added lobes get lobe type Measured.

Define Antenna Patterns

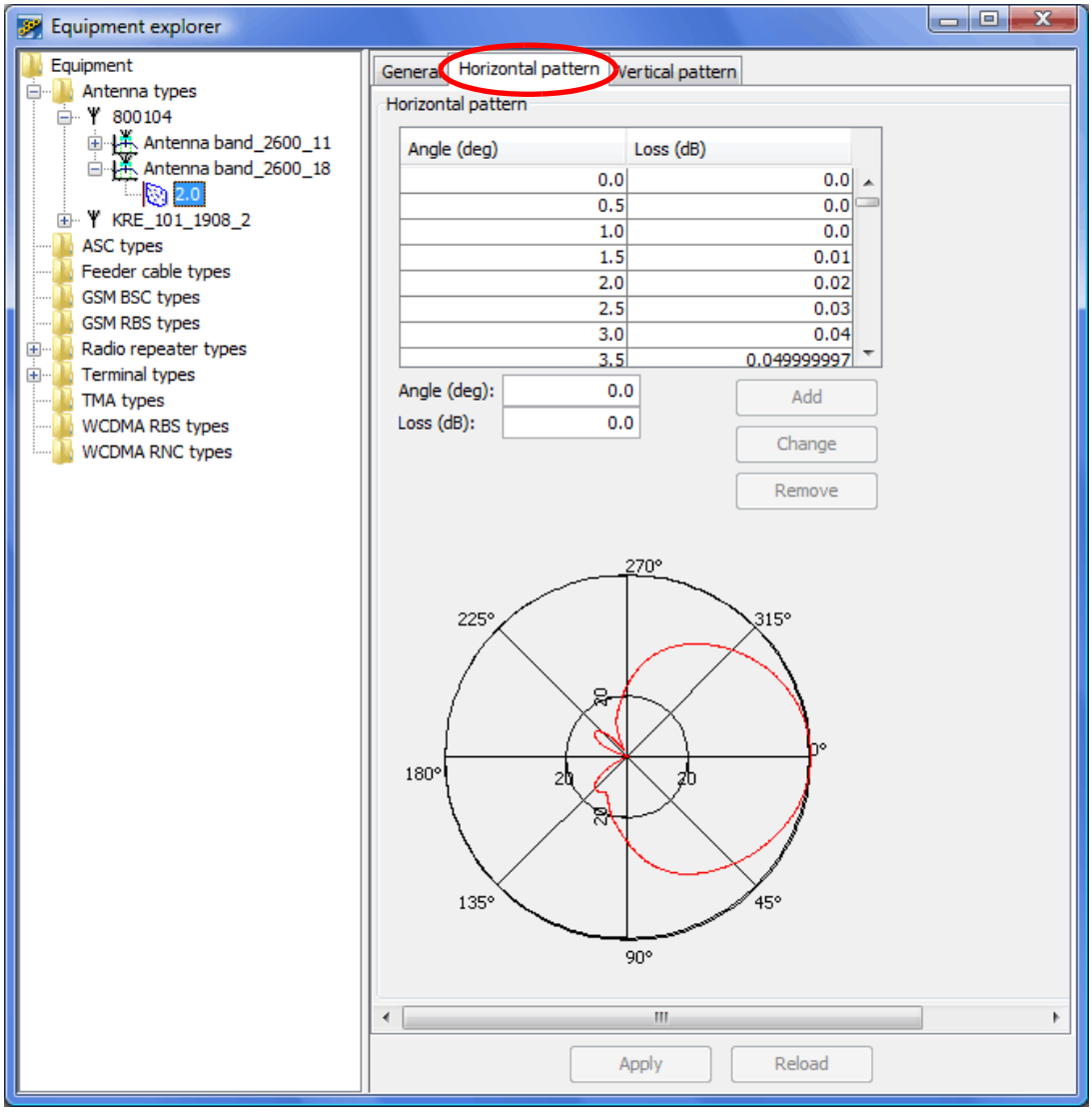
Use this procedure to define horizontal and vertical broadcast patterns to the antenna band used by the antenna. The visual display of the pattern changes as you modify the angle and loss values.

Prerequisites

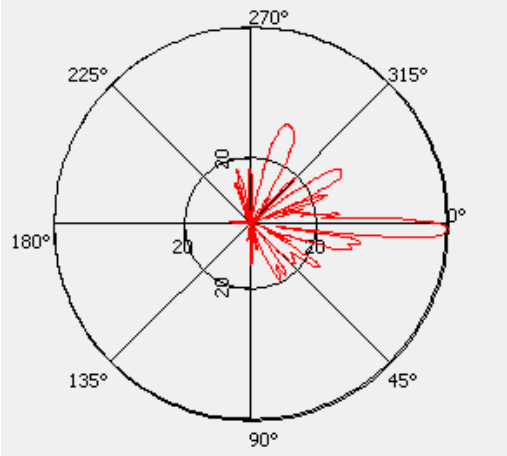
The Antenna band window is opened, see Configure Antenna Bands on page 5-38.

Procedure

1. Select the lobe to modify and select the desired pattern. In the example below, the **Horizontal pattern** tab is selected to display the current pattern:



2. Enter the Angle (deg) and the corresponding Loss (deg). These values are used to interpolate the antenna diagram. You do not need a value for each angle.
3. Correspondingly, a vertical pattern might look as in the following example:



4. Click **Apply** to preserve the settings.

Fields on Window "Horizontal pattern" or "Vertical pattern"

Angle (degree)	Angle in degrees of the antenna lobe pattern
Loss (dB)	Loss in dB of the antenna lobe pattern
Add	Adds new angle
Change	Changes loss of existing angle
Remove	Removes existing angle

Create Interpolated Antenna Lobe

Changing electrical tilt results in changes in the antenna radiation pattern. Antennas normally have a limited number of measured patterns. TEMS CellPlanner can calculate an antenna tilt based on mathematical interpolation of existing patterns so you can set the antenna lobe pattern to other values. The interpolated patterns are approximations based on the measured patterns.

Prerequisites

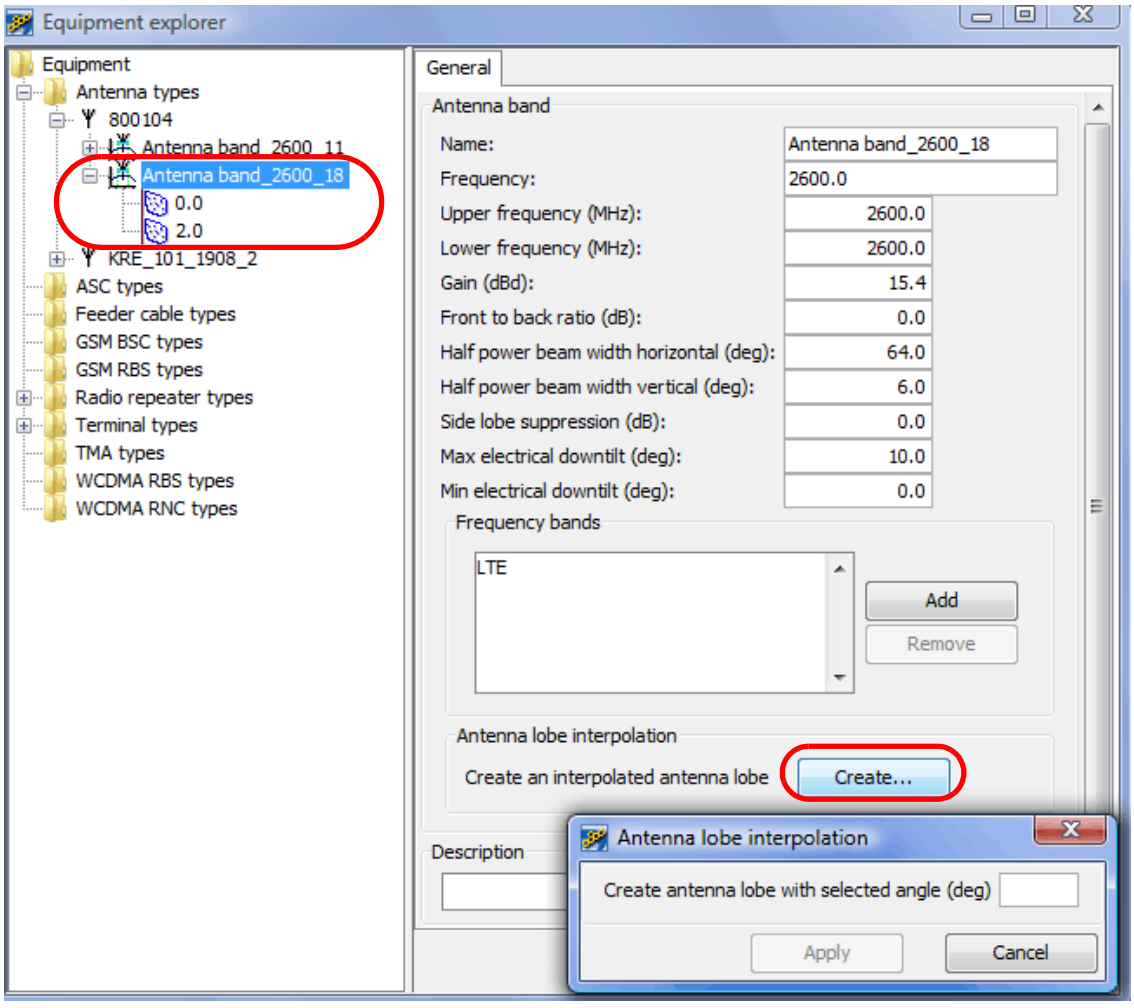
- The project must contain at least one imported antenna with at least two antenna lobes defined for the antenna band.
- A lobe with the angle to interpolate is not already defined.
- The interpolated angle must be close to the measured patterns of the imported antennas.
- Lobe patterns must be of the same length.

- The interpolated patterns to create must be within a limited range of the existing measured antenna lobe patterns. As an example, if measured patterns exist for angles 0 and 8, you can create an interpolate antenna lobe pattern for all angles between 0 and 8.

Procedure

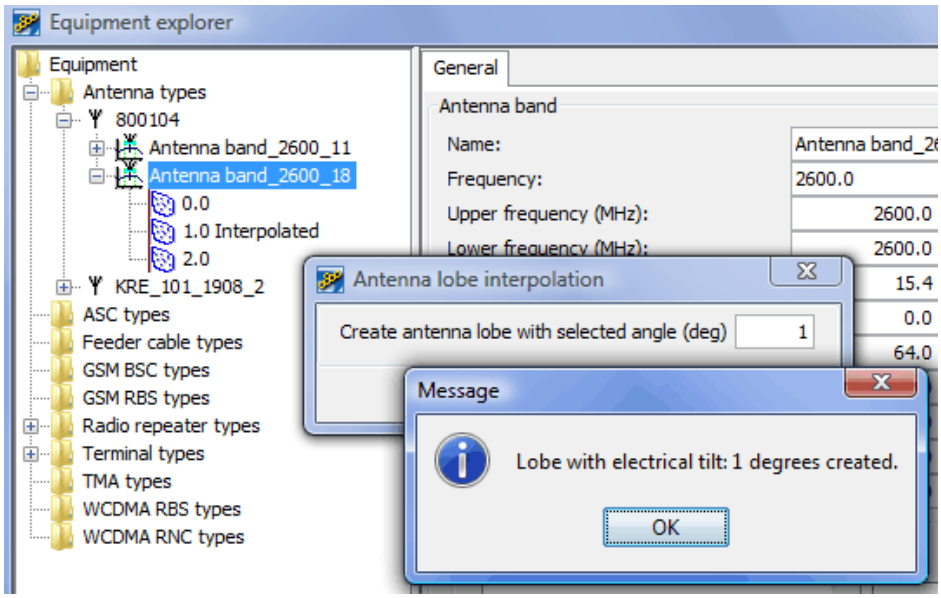
Do as follows to create an interpolated antenna lobe:

1. Click **Create** in the **Antenna band** window. The **Antenna lobe interpolation** window appears as in the following example:



2. Enter an angle for the interpolated lobe. The angle must be within the downtilt angles of the existing antenna lobes. In this example the existing antenna lobes have a downtilt of 0 and 2 degrees respectively, hence an interpolated lobe with 1 degrees downtilt is possible to create.

3. Click **Apply**. An interpolated lobe is created and displayed together with the other lobes:



Antenna-Related Equipment Types

Except for the antenna, the following equipment contributes to attenuations and gains:

- ASCs (applicable for WCDMA only)
- Feeder cables
- TMAs

Use the procedures in this chapter to define the relevant equipment types in your network plan.

Define ASC Types

Use this procedure to define antenna system controller (ASC) types.

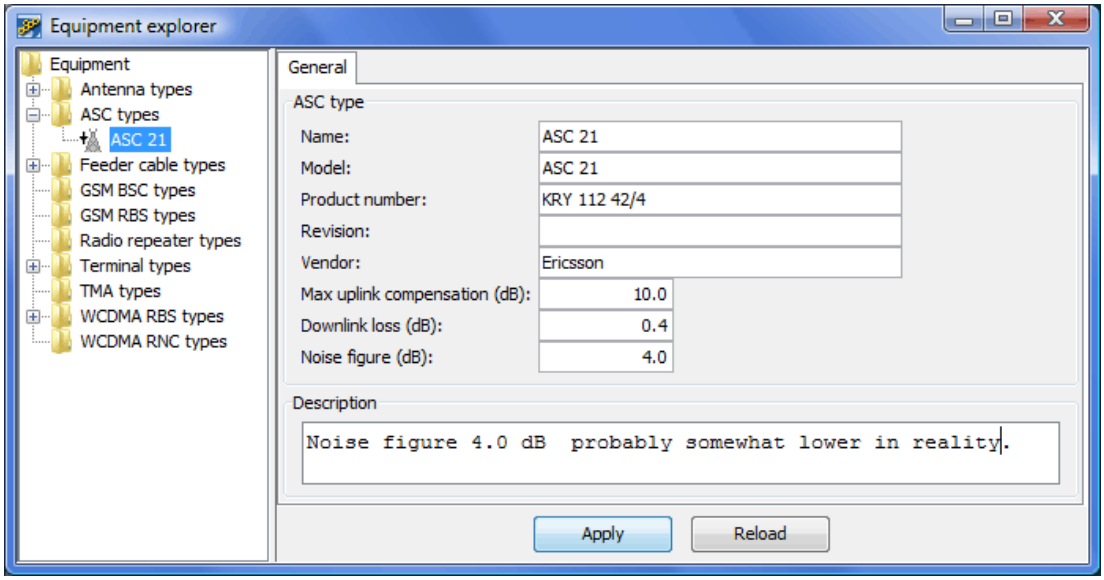
Prerequisites

A WCDMA project is opened.

Procedure

Follow these steps to define ASC types:

1. Select **Utilities↗Equipment explorer**.
2. Right-click the **ASC types** folder and select **Add ASC type** from the menu. The **ASC type** window is displayed:



3. Change information as required, and click **Apply** to preserve the settings.

Fields on Window “ASC type”

Name	Name of the ASC type. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Model	Model of antenna system controller (ASC)
Product number	Product number of the ASC
Revision	Product revision number of the ASC
Vendor	Manufacturer of the ASC
Max uplink compensation (dB)	Maximum uplink compensation in dB for the ASC. Range 0 - 15. Default = 0.
Downlink loss (dB)	Internal ASC downlink attenuation. Range 0 - 15. Default = 0.40.
Noise figure (dB)	Noise figure of the ASC. Range 0 - 20. Default = 3.
Description	Free text description of the antenna system controller

Define Feeder Cable Types

Use this procedure to define feeder cable types for antennas. The feeder cable type can be included in a feeder cable template.

Prerequisites

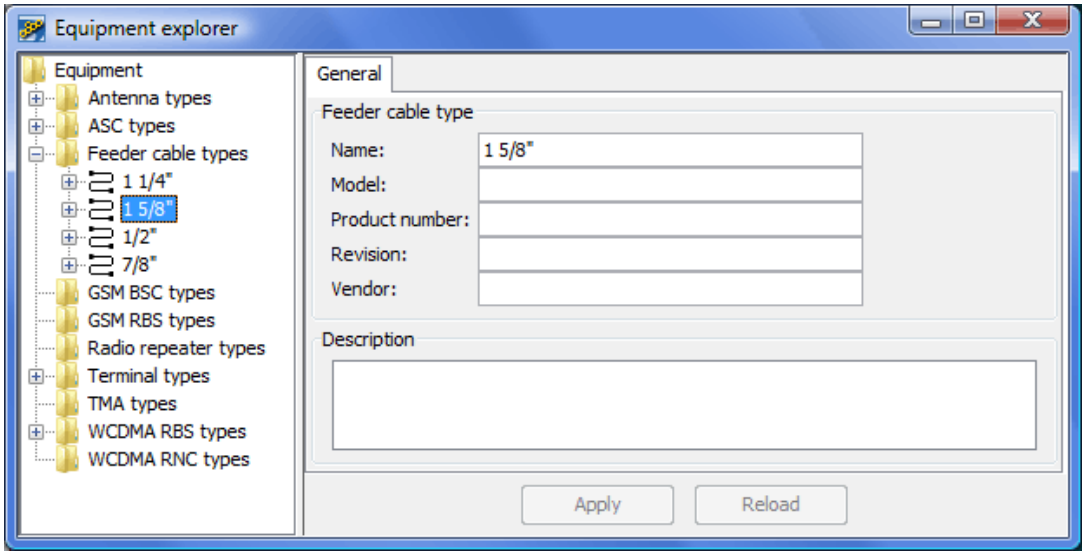
- An LTE, WCDMA, GSM or LTE project is opened
- The frequency band to be used by the feeder cable is defined

Procedure

Follow these steps to define a feeder cable type:

1. Right-click the Feeder cable type folder and select Add Feeder cable type. The **Select a Frequency band** dialog appears.

2. Select a frequency band and click **OK**. A feeder cable type object with an initial feeder loss object (named as the frequency band) appears in the browser tree, and the **Feeder cable type** window appears as in the following example:



3. Modify the parameters as required and click **Apply** to preserve the settings.
4. Proceed with Define Feeder Cable Loss on page 5-47.

Fields on Window "Feeder cable type"

Name	Name for the feeder cable type. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Model	Vendor's model number of feeder cable
Product number	Vendor's type number of the feeder cable
Revision	Product revision number of the feeder cable
Vendor	Manufacturer of the feeder cable
Description	Free text description of the feeder cable type

Define Feeder Cable Loss

A feeder cable can have different losses for different carriers. The losses depend on the frequency of the transmitted signals and can differ in uplink and downlink. Use this procedure to define the loss per meter, for uplink and downlink respectively.

Prerequisites

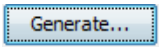
- A project is opened.
- The frequency band is defined.

Procedure

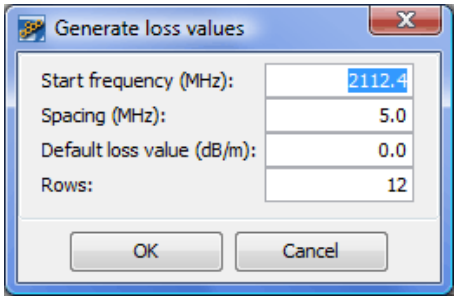
Follow these steps to define feeder cable losses:

1. Select **Utilities↗Equipment explorer**.
2. Locate the relevant feeder cable type folder in the browser tree and do any of the following:
   - To modify an existing feeder cable loss definition, select it.
   - To create a new feeder cable loss definition, right-click the feeder cable type, and select **Add Feeder cable loss** from the menu.

   In both cases The **Feeder cable loss** window is displayed, initially with all losses and frequencies set to 0.
3. Click the **Generate** button under the **Downlink** table.

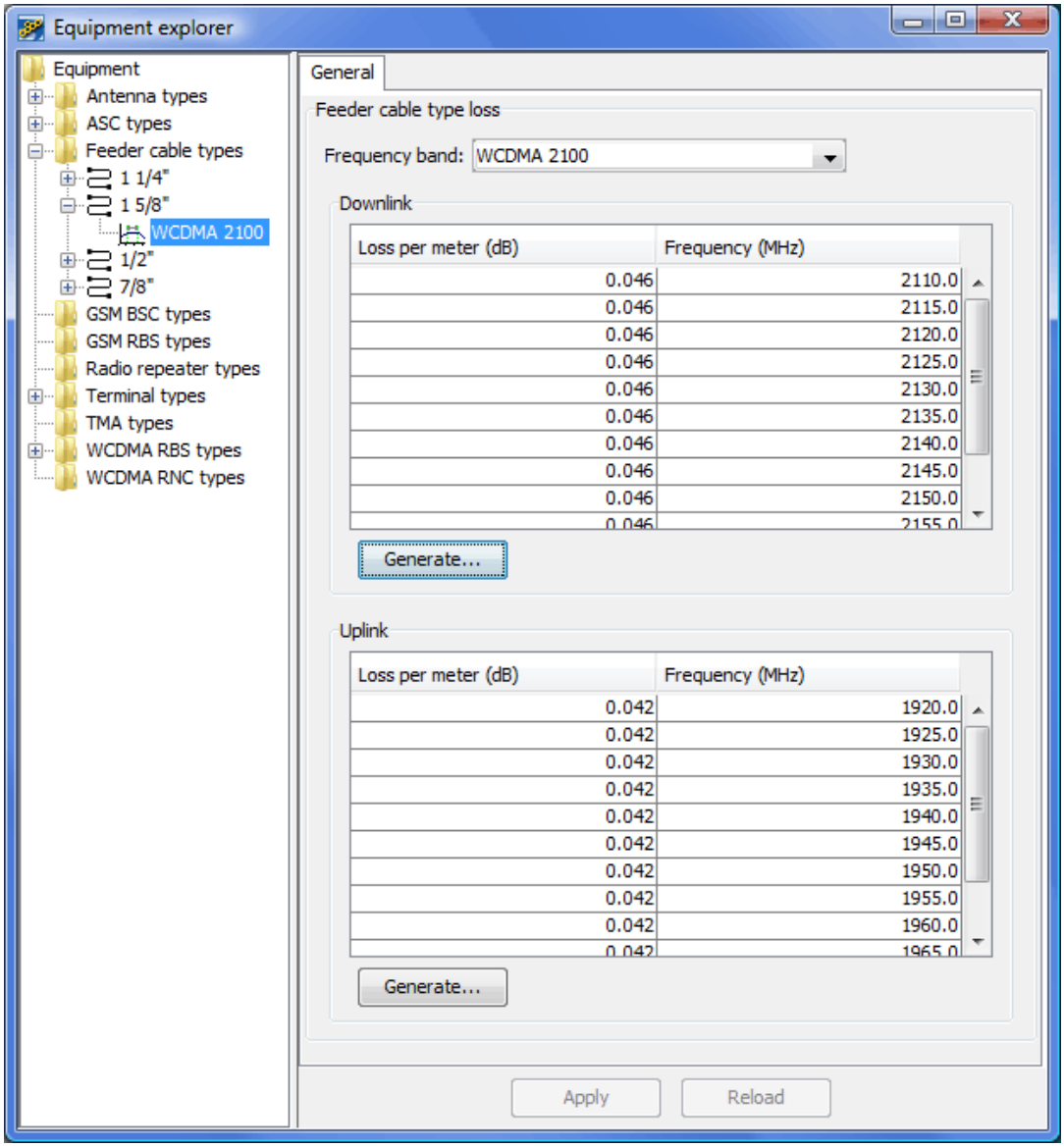


4. The **Generate loss values** dialog appears as in the following example:



5. Modify the **Default loss value** if required and click **OK**. The **Loss per meter** in the **Downlink** table is initialized from the **Default loss value**

6. Modify individual loss values for each carrier frequency. The **Feeder cable loss** window might then look as in the following example:



7. Repeat from Step 3 to generate **Uplink** loss values.
8. Click **Apply** to preserve the settings.

Fields on Window “Feeder cable type loss”

Frequency band	Frequency band of the signals conveyed via the feeder cable
Downlink	Entries for each carrier separated as defined in the Generate loss values dialog. • Loss per meter (dB) - downlink loss per meter of cable • Frequency (MHz) - base frequency of the carrier
Uplink	Entries for each carrier separated as defined in the Generate loss values dialog. • Loss per meter (dB) - uplink loss per meter of cable • Frequency (MHz) - base frequency of the carrier
Generate	Opens the Generate loss values dialog.

Define TMA Types

Use this procedure to define tower mounted amplifier (TMA) types.

Prerequisites

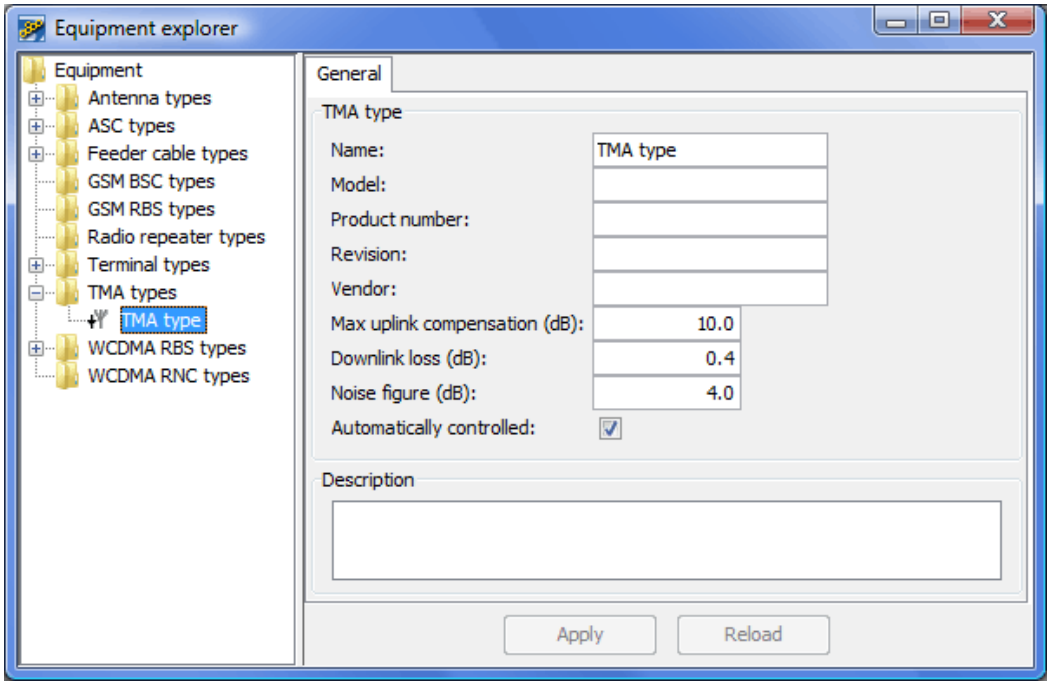
An LTE, WCDMA, GSM or WiMAX project is opened.

Procedure

Follow these steps to define TMA types:

1. Select Utilities↗Equipment explorer.
2. Right-click the TMA types folder and select Add TMA type.

3. Select **Add TMA type**. The **TMA type** window is displayed as in the following example:



4. Change information as required, and click **Apply** to preserve the settings.

Fields on Window "TMA type"

Name	Name of TMA type. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Model	Model name of the TMA
Product number	Vendor's product number of the TMA
Revision	Vendor's product revision number of the TMA
Vendor	Manufacturer of the TMA
Max uplink compensation (dB)	TMA uplink gain. Range 0 - 15. Default = 10.
Downlink loss (dB)	Losses in dB in the downlink. Range 0 - 15.Default = 0.40.
Noise figure (dB)	System noise figure in dB if TMA is used. Replaces RBS noise figure. Range 0 - 50. Default = 4.
Automatically controlled	Adjusts the compensation automatically. Initially enabled.
Description	Free text description of the TMA type

Repeater Types

Repeaters are used to amplify the radio signals, thereby extending the coverage.

TEMS CellPlanner supports two types of repeaters, namely *radio repeaters* and *cable repeaters*.

About Repeaters

Radio repeaters can be defined for LTE, WCDMA and GSM networks. A radio repeater is defined by its site identity and two antenna branches, namely a *pickup* antenna branch and a *service* antenna branch. The **pickup** antenna receives the signals from the donor cell and the **service** antenna transmits the amplified signals further in the network. The pickup and service antennas are defined in one antenna system object under the radio repeater.

A radio repeater is visualized with its own symbol on the map. The symbol is placed at the repeater's position and indicates the service antenna azimuth. The repeater is connected to its donor cell by an optionally displayed line.

A **donor cell** is the cell transmitting the radio signals to be amplified by the repeater. In WCDMA networks, the donor cell is identified by its channel number (UARFCN), which is also configured in the repeater.

Cable repeaters can be defined for WCDMA and GSM networks. A cable repeater is defined as one antenna branch.

Radio repeaters as well as cable repeaters are further characterized by radio technology specific parameters.

Pathloss Calculation Including Repeaters

The point-to-point pathlosses from all cell and cable repeater antennas to the radio repeaters pickup antennas are predicted.

The received power at the pickup antenna take into account the donor cell's output power, DL feeder loss, pathloss and the pickup antenna gain, radiation pattern and height. The donor coupling loss is then calculated, and the transmitted power is obtained from the repeater's gain and max Tx power DL.

In the next step, the coverage from all cell antennas and repeater service antennas are predicted. For every bin, the antenna or repeater giving the maximum received signal strength is selected. The maximum received signal strength is then transformed into a pathloss relative to the cell's first transmitting antenna. The pathloss is obtained from the Tx power settings and DL feeder losses of the donor cells and repeaters taken into account.

The following assumptions and limitations apply to the pathloss predictions:

- A donor cell of a radio repeater might transmit on more than one Tx antenna. In the calculations, the Tx antenna with the highest received power at the radio

repeater's pickup antenna is internally selected as the only one transmitting to the repeater. The pickup antenna's azimuth and mechanical tilt are calculated to tilt towards the selected Tx antenna.

- It is assumed that only one repeater amplifies the signals from a donor cell, although the radio signals might in reality reach several repeaters.
- Radio repeaters with frequency shifting are assumed to retransmit only the signal of the affected cell.
- Coverage in tunnels and inside buildings is not predicted.

WCDMA Interference Analysis Including Repeaters

Insertion of a radio repeater degrades the UL noise figure in the donor cell. Terminals communicating with a radio repeater will see a higher UL noise than those communicating with a cable repeater or directly with a cell.

Define Radio Repeater Types

The reason for using repeaters, and the supported repeater types, are described in Define TMA Types on page 5-50.

Prior to configuring the actual repeaters, you must use this procedure to define the radio repeater types to be used in your network plan.

Prerequisites

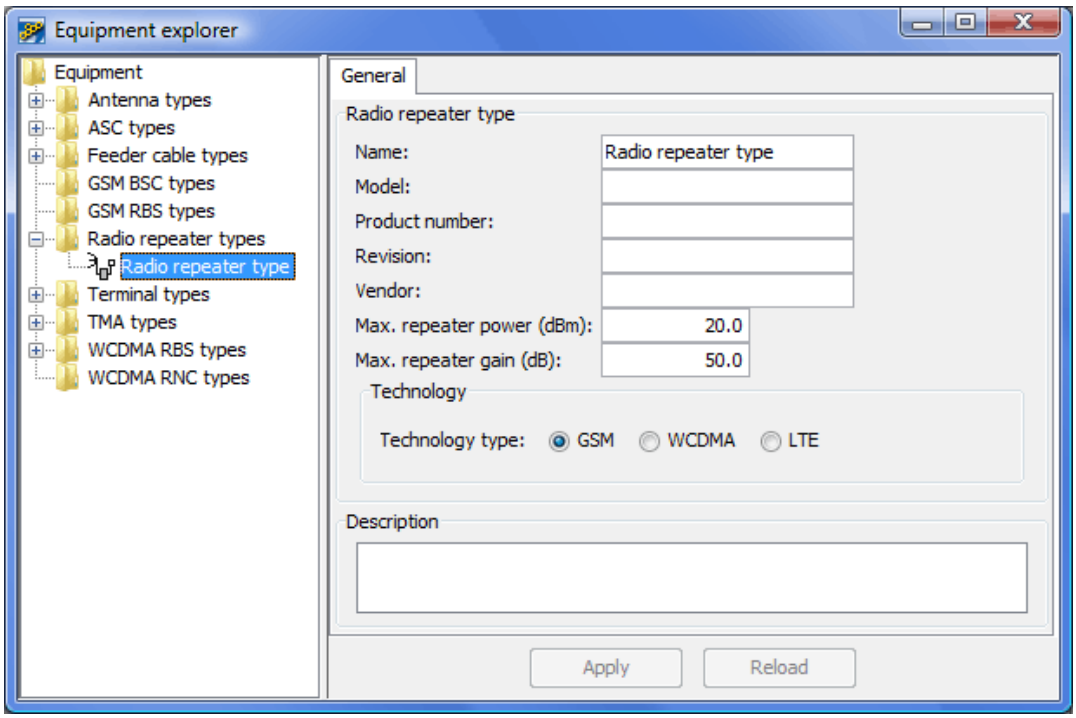
An LTE, WCDMA or GSM project is opened.

Procedure

Follow these steps to define repeater types for pickup or service repeaters:

1. Select **Utilities↗Equipment explorer**.

2. Right-click the **Radio repeater types** folder and select **Add radio repeater type** from the menu. The **Radio repeater type** window is displayed. as in the following example:



3. Modify the parameters as required and click **Apply** to preserve the settings.

Fields on Window "Radio repeater type"

Name	Name of the radio repeater type. Maximum 128 alphabetical or numerical characters. Do not use / ,\,' or %.
Model	Model name of the radio repeater type
Product number	Product number of the radio repeater type
Revision	Revision number of the radio repeater type
Vendor	Vendor of the radio repeater type
Max. repeater power (dBm)	Maximum transmitted power from the radio repeater. Range: -40 - 80. Default = 20.
Max. repeater gain (dB)	Maximum gain of the repeater. Default = 50.
Technology	Technologies supported by this repeater type.
Description	Free text description of the radio repeater type

Terminal Types

Different type of UEs, modems, and other devices might load the network to analyze. To obtain realistic analysis results, you should define the most common terminal types occurring in the network.

Define Terminal Types

Use this procedure to define terminal types for each type of user device to include in your network plan.

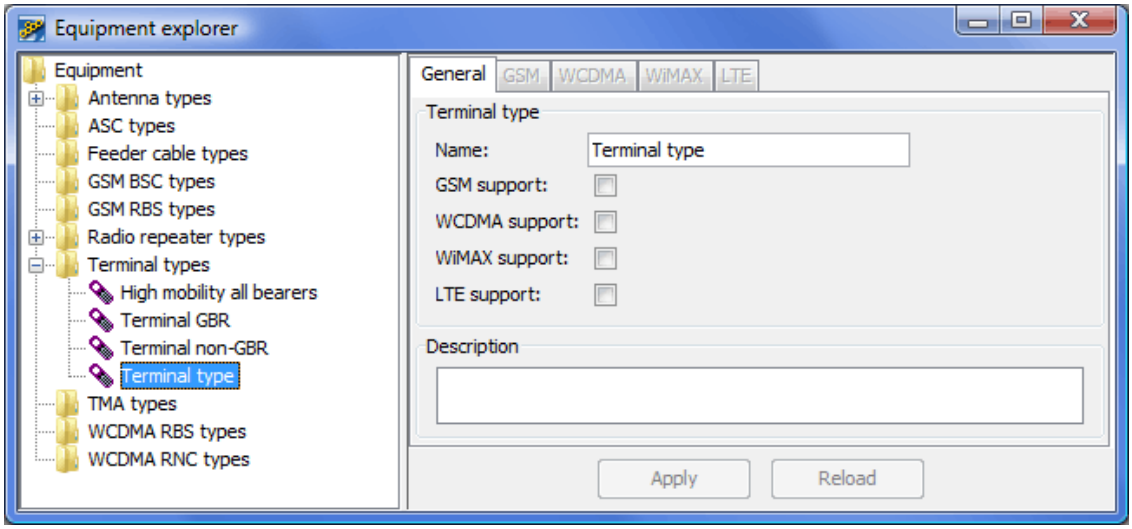
Prerequisites

A project is opened.

Procedure

Follow these steps to add terminals to the network plan:

1. Select **Utilities↗Equipment explorer**.
2. Right-click the **Terminal types** folder and select **Add Terminal** from the menu. The **Terminal types - General** window is displayed:



3. Modify the parameters as required, and click **Apply** to preserve the settings.
4. Depending on the technology supported, configure the technology specific terminal parameters as described in *TEMS CellPlanner GSM User's Guide*, *TEMS CellPlanner WCDMA User's Guide*, *TEMS CellPlanner WiMAX User's Guide* or the *TEMS CellPlanner LTE User's Guide*.

Fields on Window “Terminal types - General”

Name	Type of terminal. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Antenna height (m)	The height of the terminal antenna. Range 0 - 100. Default = 1.5.
GSM support WCDMA support WiMAX support LTE support	Indicates that the terminal type supports the specified radio technology. Selecting this option enables the corresponding tab.
Description	Description of the terminal type

About the Template Explorer

Use templates to define standard parameter configurations and create sites.

You can save time when creating the network plan by using templates. The templates are particularly efficient for planning large networks where many sites share the same types of equipment and systems.

Template windows are almost always exact duplicates of windows in other explorers.

The templates common to several radio technologies are described in this manuel. The radio technology specific templates are described in the user guide of that technology.

To calculate pathloss from template data, you must enter the minimum required parameters when you define templates. These parameters include:

- RBS location (position in either longitude/latitude, decimal longitude/latitude, or grid)
- Antenna height above ground level (in meters)
- Antenna type
- Antenna direction (degree from true North)
- EIRP or ERP (effective isotropic radiated power (dBi) or effective radiated power (dBd))
- Pilot channel power (PCPICH)

Define Antenna Templates

To speed up to definition of RBSs and radio repeaters you can use *antenna templates* defining antenna type, tilts, azimuths and heights. The antenna templates are included in *antenna system templates*, in its turn included in RBS and radio repeater templates.

Prerequisites

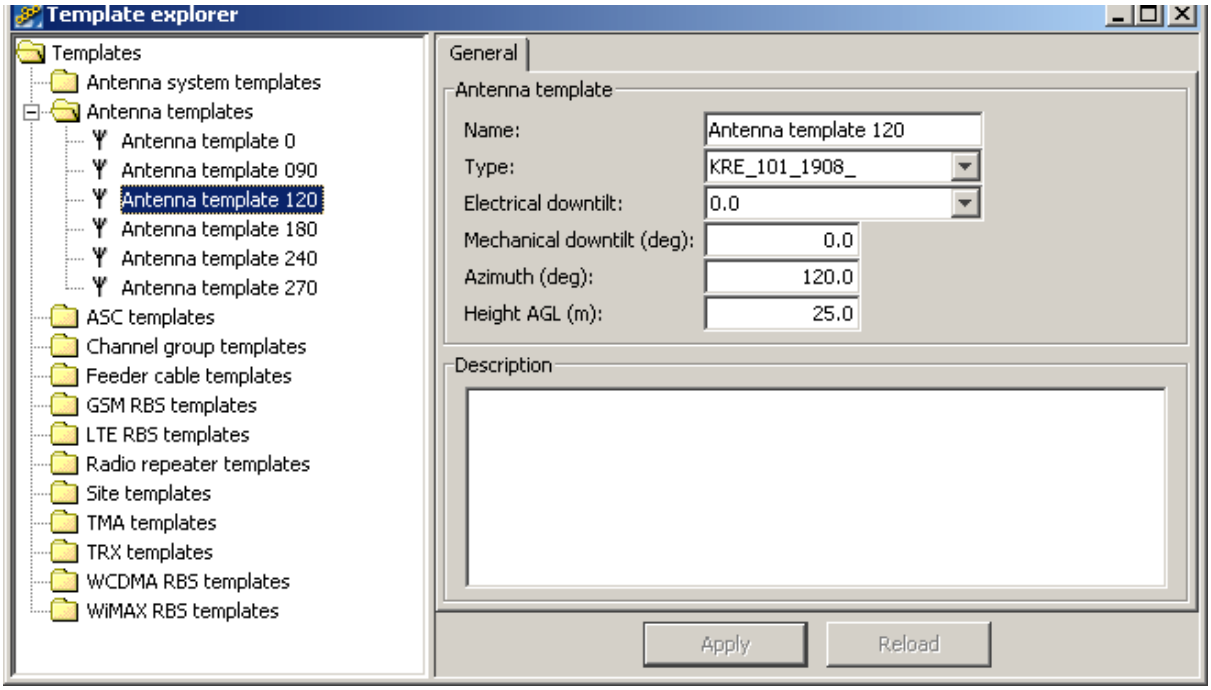
- A project is opened.
- The antenna type to associate with the antenna template is defined, see Define Antenna Types on page 5-36.

Procedure

Follow these steps to define an antenna template:

1. Select **Utilities↗Template explorer**.
2. Right-click the **Antenna** folder, and select **Add Antenna template** from the menu. The **Antenna template** window appears.
3. Enter a suitable **Name**, for example relating to the azimuth.
4. Modify the other parameter values, see Fields on Window "Antenna template" on page 5-59.

5. Click **Apply** to preserve the settings.The following example shows six antenna templates of different azimuths:



Fields on Window "Antenna template"

Name	Name of the template. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Type	Antenna type selected from list of defined (preferably first imported) antenna types. If two antenna branches shall be used in the same sector, both must use the same antenna type. 0 = non-Ericsson product
Electrical downtilt	Electrically controlled downtilt in degrees relative to the vertical plane. The tilt angle can be modified by remote signaling. Range: -30 to 30. Default = 0.
Mechanical downtilt (deg)	Mechanical downtilt in degrees relative to the vertical plane. The tilt angle is fixed and set when the antenna is mounted. Range: -90 to 90. Default = 0.
Azimuth (deg)	Beam direction in degrees, calculated clockwise from north. Range 0 - 360. Default = 0.
Height AGL (m)	Antenna height in meters above ground level. Range 0 - 600. Default = 25 meters.
Description	Optional description of the antenna template.

Define ASC Templates

To speed up the definition of ASCs you can define ASC templates.

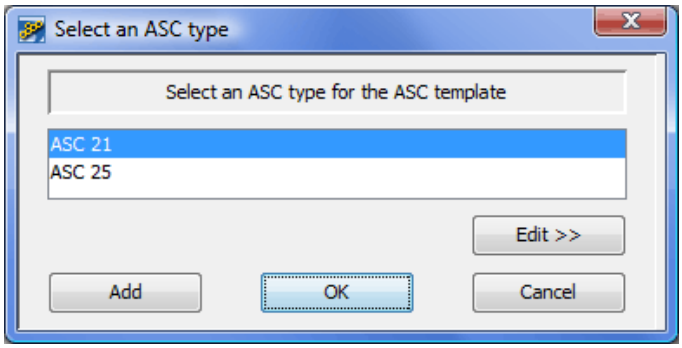
Prerequisites

- A WCDMA, LTE or GSM project is opened.
- The ASC type to associate with the ASC template is defined, see Define ASC Types on page 5-45.

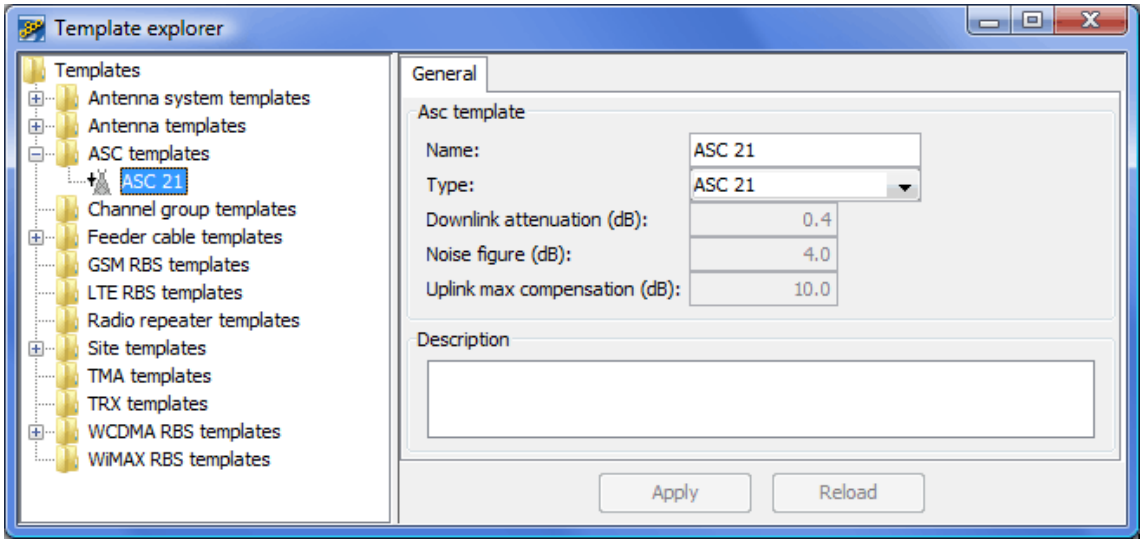
Procedure

Follow these steps to define an ASC template:

1. Select **Utilities↗Template explorer**, and right-click the **ASC templates** folder.
2. Select **Add ASC template**. The **Select an ASC type** dialog appears:



3. Select an ASC type and click **OK**. The **ASC template** window appears:



4. Modify the parameters as required and click **Apply** to preserve the settings.

Fields on Window “ASC template”

Name	Name of the template. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Type	Type of ASC selected from list of defined ASC types.
Downlink attenuation (dB)	Downlink loss in dB. Range: 0-15. Initial value: 0.40 dB.
Noise figure (dB)	System noise figure in dB if TMA is used. Replaces RBS noise figure. Range: 0-20. Initial value: 3 dB.
Uplink max compensation (dB)	TMA uplink gain in dB. Range: 0-15. Initial value: 10 dB.
Description	Free text description of the ASC template

Define Feeder Cable Templates

To speed up the definition of feeder cables you can use templates for feeder cables of a certain type or length.

The feeder cable templates can further be included in *antenna system templates*, in its turn included in RBS and radio repeater templates, usable as a basis when defining RBSs and radio repeaters in your network plan.

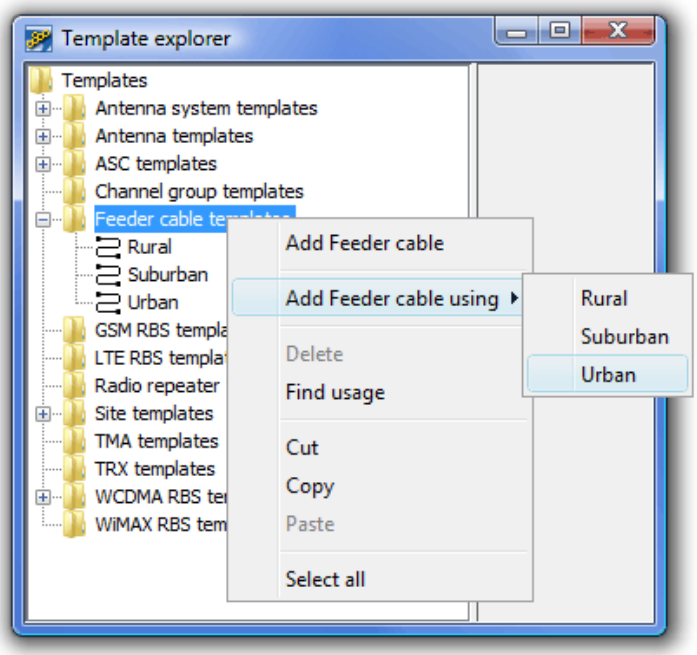
Prerequisites

- A project is opened.
- The feeder cable type to associate with the feeder cable template is defined, see Define Feeder Cable Types on page 5-46.

Procedure

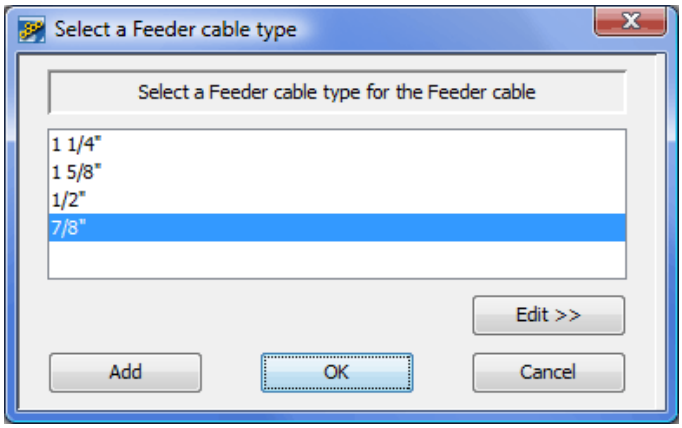
Follow these steps to define a feeder cable template:

1. Select **Utilities↗Template explorer**.
2. If feeder cable templates are already defined, you can use them as a basis for a new template. Right-click the **Feeder cable templates** folder and select **Add Feeder cable using...**. Then select a template as in the example below and proceed to Step 5.

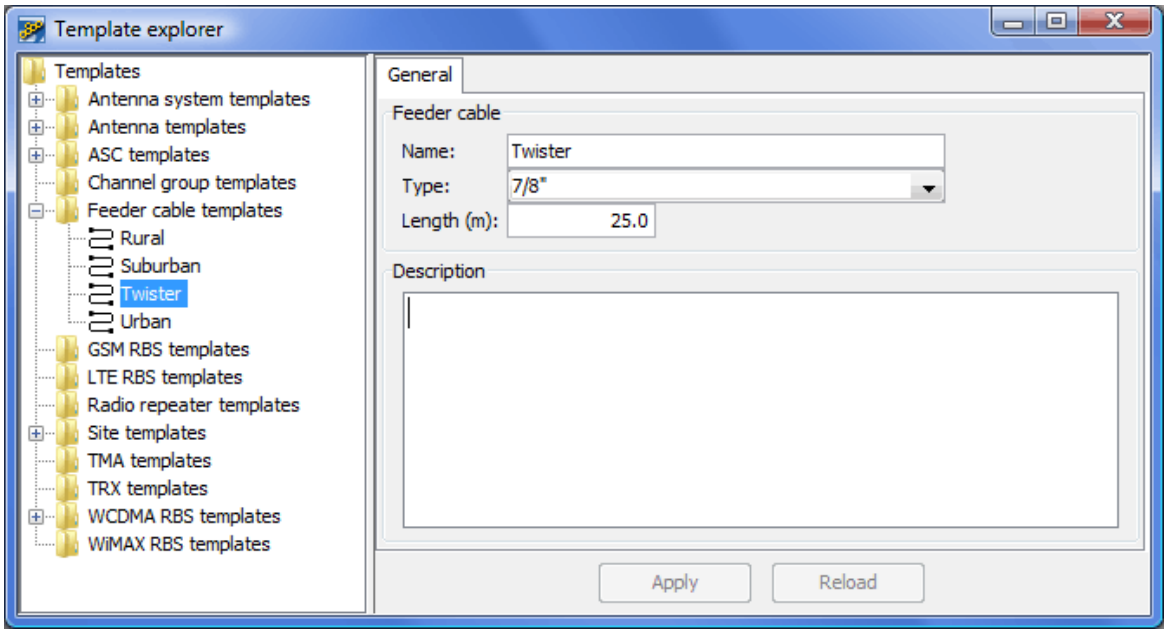


3. If no feeder cable templates are defined or if you do not want to use any of the existing templates, you must create it from scratch. Right-click the **Feeder cable**

templates folder and select **Add Feeder cable.** The **Select a Feeder cable type** window appears as in the following example:



4. Select a feeder cable type and click **OK**. The **Feeder cable** window appears as in the following example:



5. Modify the parameters as required and click **Apply** to preserve the settings.

Fields on Window "Feeder cable"

Name	Name of the template. Defaults to "Feeder cable". Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Type	Type of feeder cable

Length (m)	Length in meters of the feeder cable type. Range 0 - 1000. Default = 25 meters.
Description	Free text description of the feeder cable template

Define TMA Templates

To speed up the definition of TMAs you can define TMA templates.

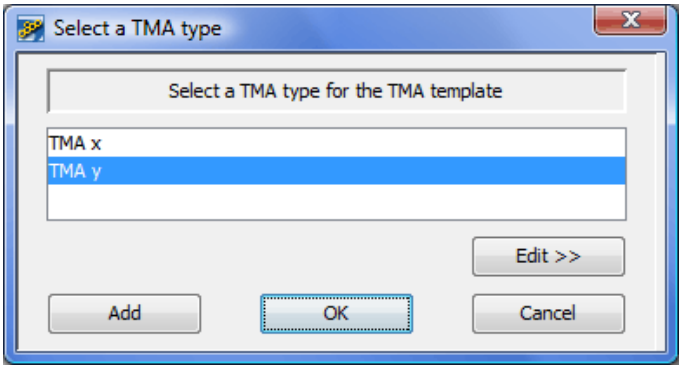
Prerequisites

- A project is opened.
- The TMA type to associate with the TMA template is defined, see Define TMA Templates on page 5-65.

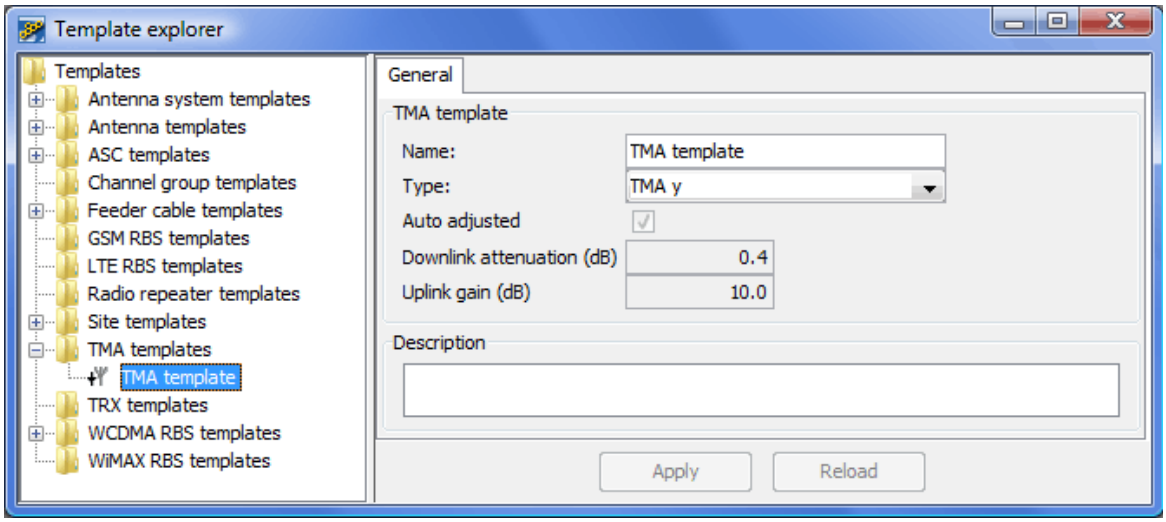
Procedure

Follow these steps to define a TMA template:

1. Select **Utilities↗Template explorer**, and right-click the **TMA templates** folder.
2. Select **Add TMA template.** The **Select a TMA type dialog** appears:



3. Select a TMA type and click **OK**. The **TMA template** window appears:



4. Modify the parameters as required and click **Apply** to preserve the settings.

Fields on Window “TMA template”

Name	Name of the template. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Type	Type of tower mounted amplifier
Auto adjusted	Indicates that the compensation is automatically adjusted
Downlink attenuation (dB)	Loss in dB in downlink
Uplink gain (dB)	TMA uplink gain in dB
Description	Free text description of the TMA template

Define Antenna System Templates

Learn about antenna systems in chapter Antenna Systems and Antenna Branches on page 7-11.

As the same type of antenna-related equipment is often used throughout parts of a real network, it is efficient to use *antenna system templates* when defining cells (sectors) and radio repeaters. An antenna system template is a set of templates of the following types:

- Antenna templates
- ASC templates - applicable for WCDMA networks only
- Feeder cable templates
- TMA templates

One antenna system template can include a multiple number of each of the templates above, for example three antenna templates and two TMA templates.

The final selection of which of each template to use in a cell (or sector) or radio repeater is defined per antenna branch, see Define Antenna Branch Templates for Sectors and Cells on page 5-69.

Prerequisites

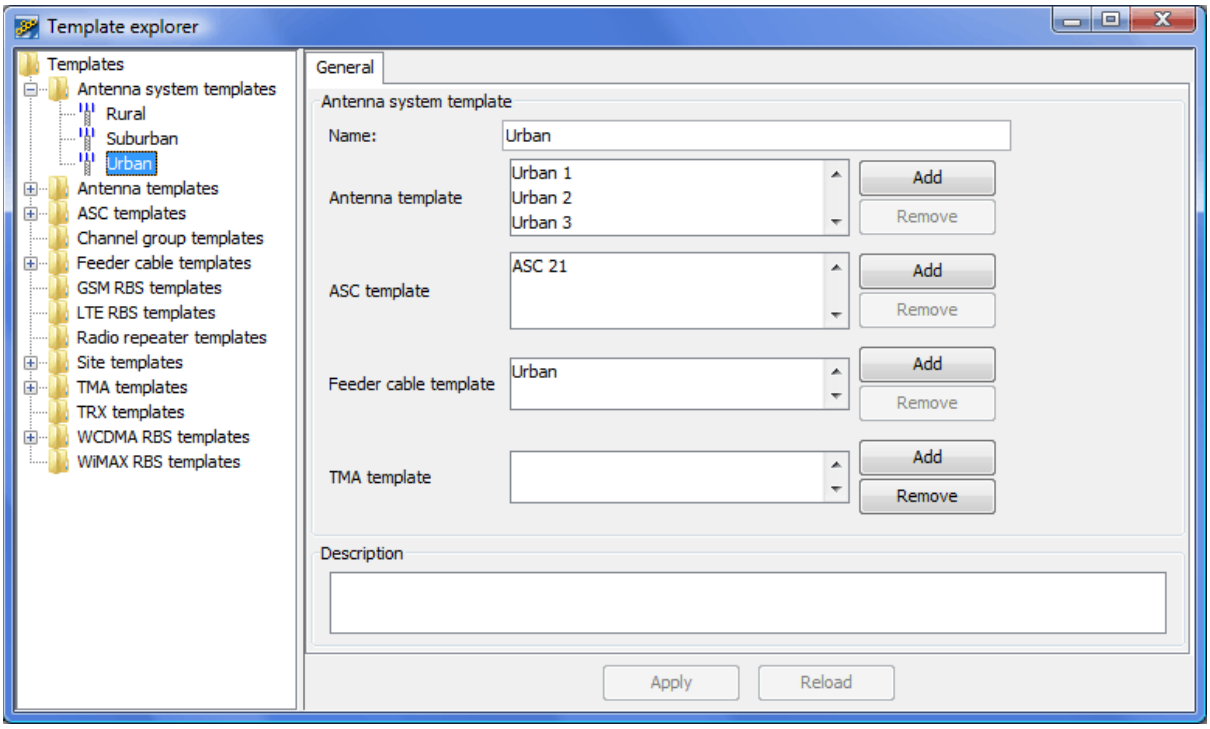
- A project is opened
- The relevant templates to include in the antenna system template are defined:
  - Define Antenna Templates on page 5-58
  - Define ASC Templates on page 5-60
  - Define Feeder Cable Templates on page 5-62
  - Define TMA Templates on page 5-65

Procedure

Follow these steps to define antenna system templates:

1. Select **Utilities↗Template explorer**.
2. Right-click the **Antenna system** folder, and select **Add Antenna system template** to display the **Antenna system template** window.
3. Enter a descriptive **Name** for the antenna system template.

4. Select the required templates to use with the antenna system. The template might look as in the following example:



5. Click **Apply** to preserve the settings.

Fields on Window "Antenna system templates"

Name	Name for the antenna system template. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Antenna template	The antenna template(s) of the antenna system template
ASC template	The antenna system controller (ASC) template (s) of the antenna system template
Feeder cable template	The feeder cable template(s) of the antenna system template
TMA template	The TMA templates of the antenna system template
Add	Adds a template to the antenna system template
Remove	Removes a template from the antenna system template

Define Antenna Branch Templates for Sectors and Cells

Using antenna branch templates is efficient when building a network plan with many sites of the same equipment configuration and propagation model.

In About Antenna Branches on page 7-12 you find a brief description about radio technology specific adaptations for antenna branches.

An antenna branch template of a sector (LTE, WCDMA) or cell (GSM, WiMAX) includes the following information:

- a propagation model for propagation to mobile terminals
- optional, for LTE and WiMax only:
  a PtP (point-to-point) propagation model for propagation to fixed subscribers
- extra attenuation in rx and tx
- equipment templates:
  - an antenna template
  - optional: an ASC template (for WCDMA only)
  - optional: a feeder cable template
  - optional: a TMA template
- optional, for antenna branches including cable repeaters:
  maximum power of the cable repeater

For sectors or cells with TMAs, feeder cables or ASCs you must use an antenna branch template including templates of the relevant equipment.

For sectors or cells without TMAs, feeder cables and ASCs, it is optional but recommended to define antenna branch templates.

Note: *If you create an antenna branch without using such an antenna branch template, you cannot later associate the antenna branch with definitions of TMA, feeder cable or ASC.*

How to create and configure antenna branches (and antenna branch templates) is described in the user's guide of respective radio technology (LTE, WCDMA, WiMAX, GSM).

Define Radio Repeater Templates

You can save time by using templates when defining radio repeaters. Use this procedure to define radio repeater templates.

Prerequisites

- An LTE, WCDMA or GSM project is opened.
- The radio repeater type to associate with the radio repeater template is defined, see Define Radio Repeater Types on page 5-53.
- The antenna system template to associate with the radio repeater template is defined, see Define Antenna System Templates on page 5-67.

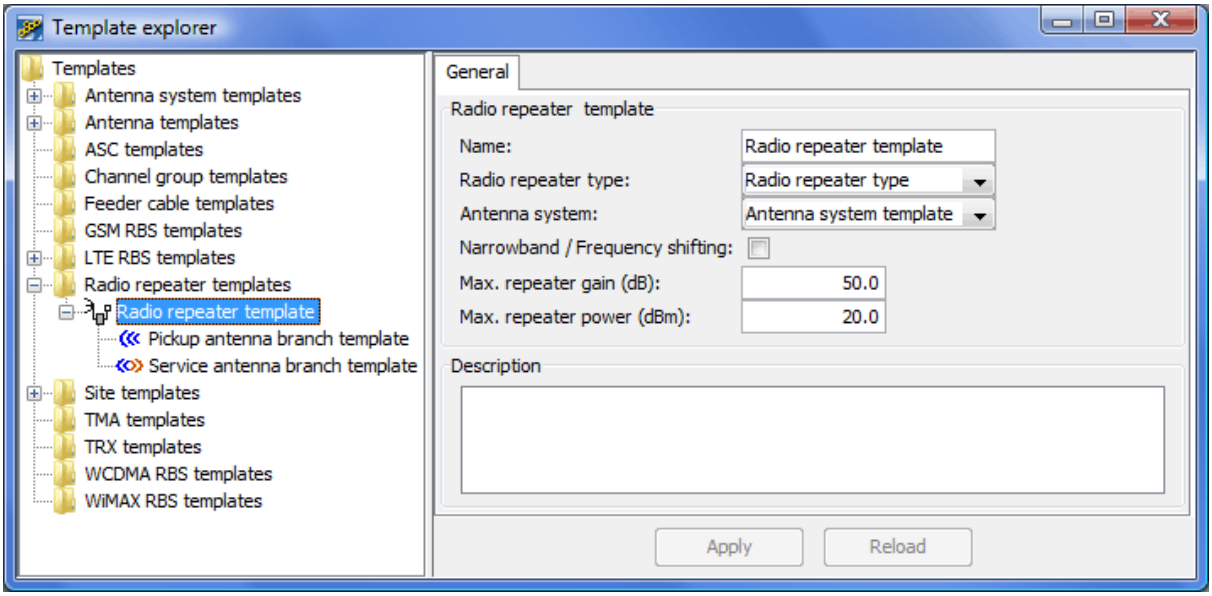
Procedure

Follow these steps to define a radio repeater template:

1. Select **Utilities↗Template explorer**, and right-click the **Radio repeater templates** folder.
2. Select **Add Radio repeater template.** A number of dialogs appear one by one. For each dialog, select the appropriate object
   - antenna system for the radio repeater template
   - antenna template for the pickup antenna branch
   - antenna template for the service antenna branch
   - radio repeater type for the radio repeater template
   - propagation model for the service antenna branch

   and click **OK.**

3. The radio repeater template object is created in the browser tree, and the **Radio repeater template** window is displayed as in the following example:



4. Modify the parameters as required, see parameter descriptions in Fields on Window "Radio repeater template" on page 5-71.

5. Click **Apply** to preserve the settings.

Fields on Window "Radio repeater template"

Name	Name of the template. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Radio repeater type	Selected from list of defined radio repeater types
Antenna system	Antenna system used by the radio repeater. Selected from list of defined antenna system templates
Narrowband / Frequency shifting	Indicates that radio repeaters using this template are of a narrowband/frequency shifting conversion type. Initially false.
Max. repeater gain (dB)	Maximum repeater gain
Max. repeater power (dBm)	Maximum transmitted power from radio repeaters using this template. Range: -40 to 80.
Description	Optional description of this template

Define Site Templates

Site templates save you time when you have many sites using the same type of antenna systems, RBSs and site attributes in your network plan.

Use this procedure to define site templates for any radio technology supported by TEMS CellPlanner.

You can define single-technology RBS sites, multi-technology RBS sites (such as cosited WCDMA and GSM RBSs) and radio repeater sites.

Prerequisites

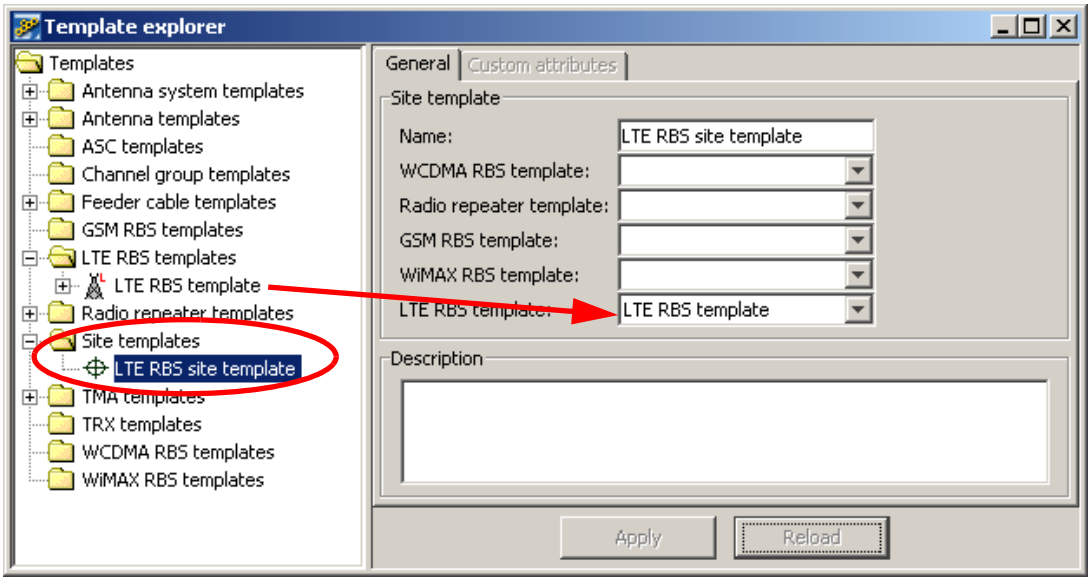
The templates to include in the site template are defined. See Define Radio Repeater Templates on page 5-70, and procedures about defining RBS templates in the user guides of LTE, WCDMA, GSM and WiMAX.

Procedure

To define an LTE RBS site template, follow these steps:

1. Select **Utilities↗Template explorer**.
2. Right-click on **Site templates**, and select **Add site template**. The **Site template - General** window appears.
3. Enter a descriptive **Name** of the template.
4. If the template defines an RBS site, select one or more RBS templates.
5. If the template defines a radio repeater site, select a radio repeater template.
6. If you have defined custom attributes for sites, you can select flag values for the LTE site template under the **Custom attributes** tab.

7. Click **Apply** to preserve the settings. The result might look as in the following example defining an LTE RBS site:



Fields on Window "Site Template"

Name	Name of the site template. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
WCDMA RBS template	Selected from list of WCDMA RBS templates
Radio repeater template	Selected from list of radio repeater templates
GSM RBS template	Selected from list of GSM RBS templates
WiMAX RBS template	Selected from list of WiMAX RBS templates
LTE RBS template	Selected from list of LTE RBS templates
Description	Optional description of the site template

Add Radio Repeaters to Sites

Use this procedure to add radio repeaters to sites. Repeaters provide extended coverage due to the amplification of radio signals in the repeater.

After you add a radio repeater, its symbol is displayed on the map. The symbol is placed at the repeater's position and indicates the service antenna azimuth. The repeater is connected to its cell by a line.

When you add a radio repeater to a site, TEMS CellPlanner adds two antenna branches to the repeater:

Antenna Type	Icon in Site Explorer	Function of Antenna
Pick-up antenna		In the downlink direction, the pickup antenna receives the signal transmitted from the donor cell, amplifies it, and transmits the amplified signal via its service antenna to extend the coverage of the cell.
Service antenna		In the uplink direction, the service antenna receives the signal transmitted from the donor cell and the pickup antenna transmits to extend coverage. The radio repeater's amplifier adds some noise, so for LTE and WCDMA, a new calculation of the noise figure is performed.

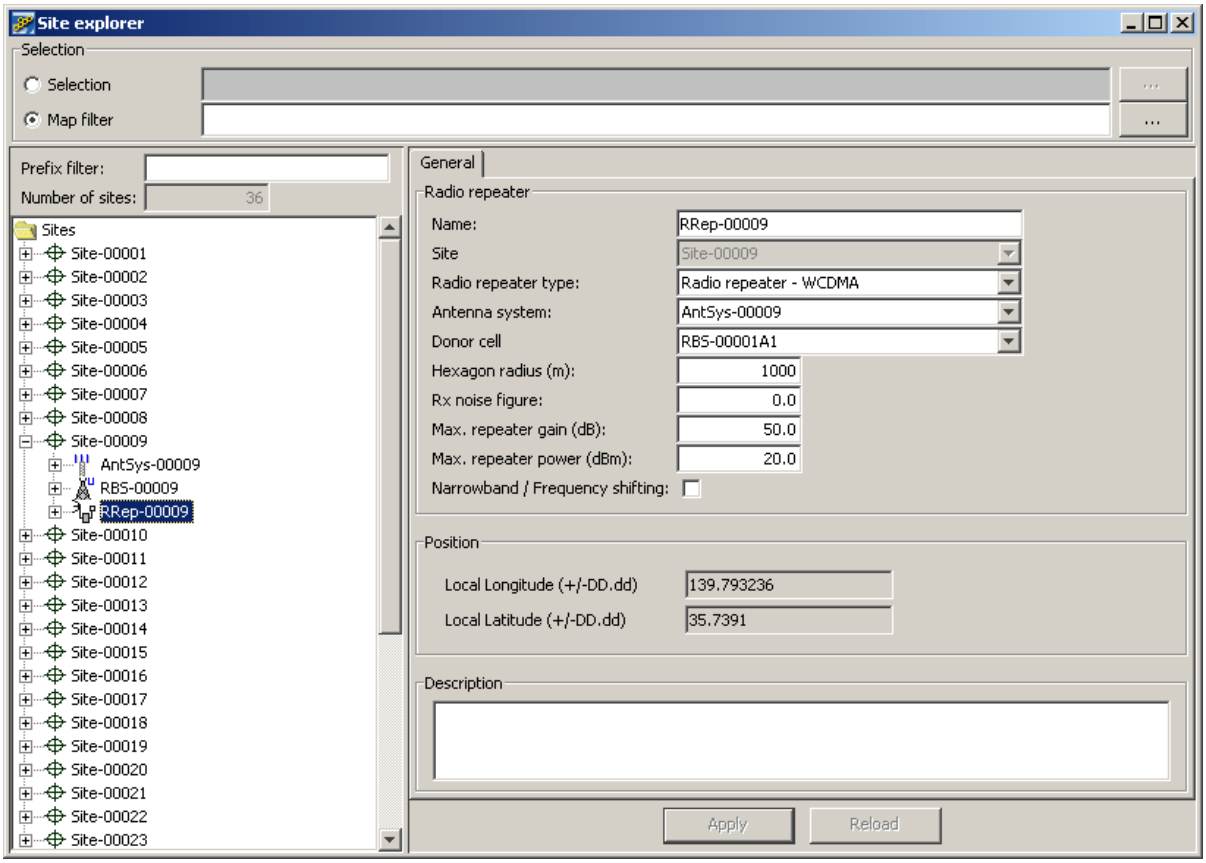
Prerequisites

- Before you can add a repeater to a network plan, you must define the cell and add antennas to the cell.
- Before you can add a repeater to a cell with multiple antennas, additional antennas (identical to cable repeaters) must be added to the cell.

Procedure

Follow these steps to add a radio repeater to a site:

1. Select **Utilities↗Site explorer**, and select the site to which you want to add a repeater. The **Radio repeater** window is displayed:



2. Add or change information as required and click **Apply** to preserve the information. The radio repeater and the pickup and service antenna branches are added to the site.

Fields on Window "Radio repeater"

Name	Name of the pre-defined radio repeater. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Site	Site name
Radio repeater type	Type of pre-defined radio repeater
Antenna system	Antenna system associated with the site.
Donor cell	Donor cell for radio repeater characteristics
Hexagon radius	Radius in meters of the radio repeater hexagon
Rx noise figure	Rx noise figure of repeater
Narrowband / Frequency shifting	Indicates whether or not the repeater amplifies carrier frequencies other than the desired one.

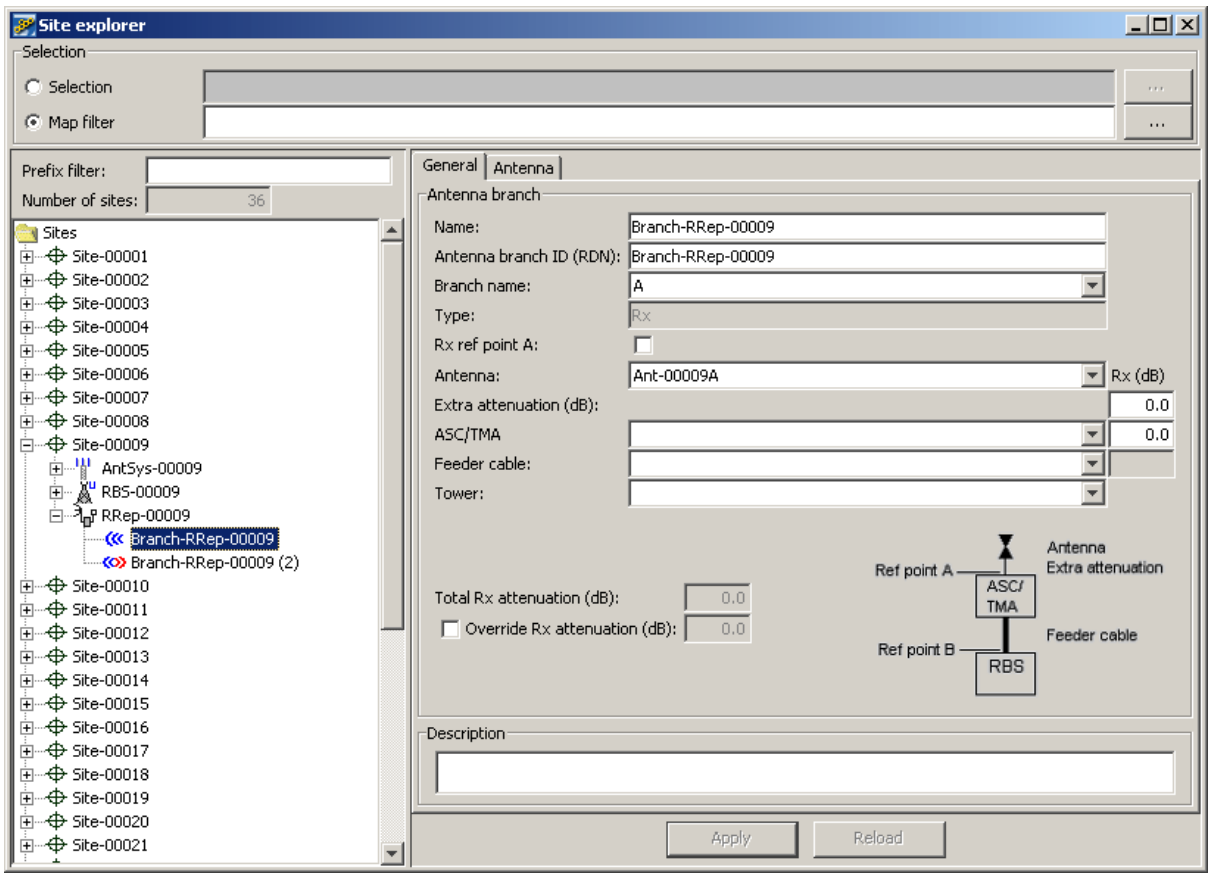
Max. repeater gain (dBm)	Maximum repeater gain in dBm
Repeater power (dBm)	Maximum repeater power in dBm
Global position east (+/-DD.dd)	Location of the repeater, taken from the site information.
Global position north (+/-DD.dd)	Location of the repeater, taken from the site information.
Description	Description of the radio repeater.

Add Radio Repeater Pickup Antenna Branch

Use this procedure to add or change settings of the pickup antenna branch for a radio repeater.

Window to Use

Use the **Radio repeater antenna branch - General** tab to add or change settings for the pickup antenna branch:



Fields on Window “Antenna branch”

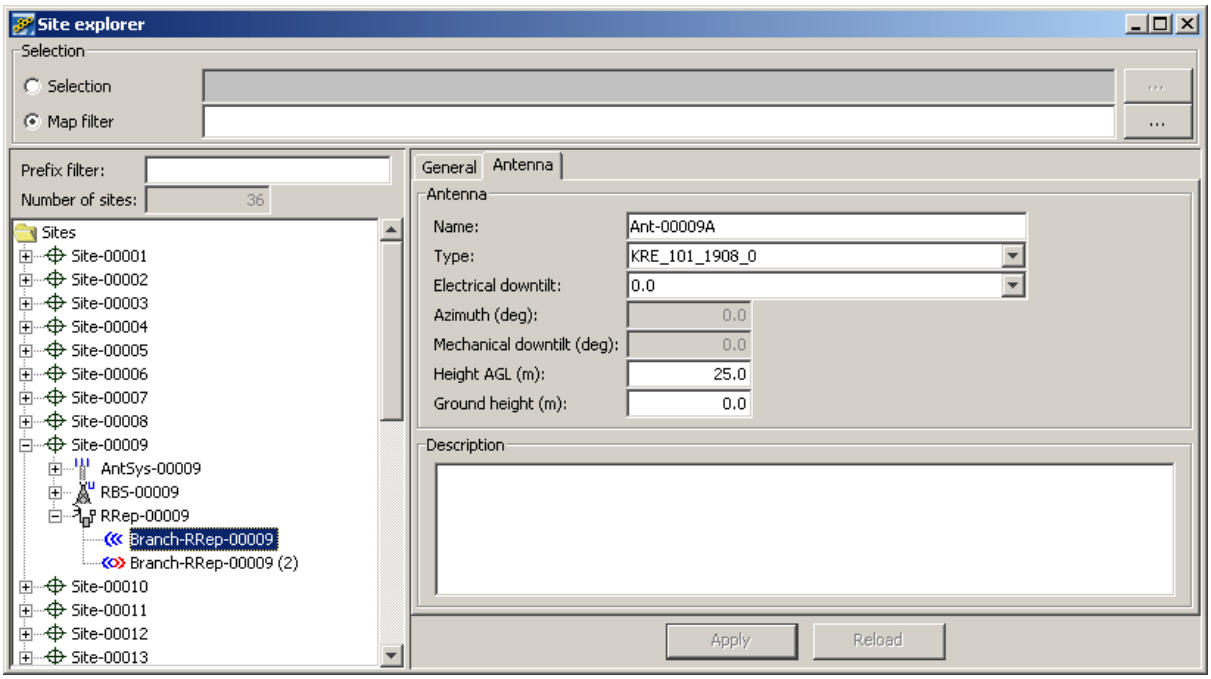
Name	Name of the antenna branch. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Antenna branch ID (RDN)	Relative distinguished name (RDN) used to identify the antenna branch
Branch name	Name of the antenna branch. The characters *A* and *B* indicate branches. The second antenna branch in a sector must have the same value as the first. Default = A.
Type	Type of transmission of the antenna branch: • Rx • Tx • Rx/Tx Default = Rx/Tx
Ref point A	Indicates the antenna branch uses reference point A, the Integration reference point of the antenna branch.
Antenna	Type of antenna for the antenna branch
Extra attenuation (dB)	Extra UL loss values in decibels, added to the **Total Rx attenuation**. Range 0 - 50. Default = 0.
ASC/TMA	Antenna system controller (ASC)/Tower mounted amplifier (TMA) type used with the antenna branch
Feeder cable	Feeder cable type used with the antenna branch
Total Rx attenuation (dB)	Total UL attenuation in decibels, summed up by attenuation contributions from all equipment in the antenna branch. Not used if **Override Rx attenuation** is selected. Range: 0 - 100. Default = 0.
Override Rx attenuation	If selected, the associated attenuation value overrides the **Total Rx attenuation**. Range: 0 - 100. Default = 0.
Description	Description of the antenna branch

Add Antenna to Radio Repeater Pickup Antenna Branch

Use this procedure to add or change antenna settings for the pickup antenna branch of a radio repeater.

Window to Use

Use the **Radio repeater antenna branch - Antenna** window to add or change antenna settings for the pickup antenna branch of a radio repeater:



Fields on Window "Antenna"

Name	Name of the antenna type. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Type	The type of antenna
Electrical downtilt	The angle of electrical downtilt for the antenna.
Azimuth (deg)	Beam direction in degrees, calculated clockwise from north. Range 0 - 360. Default = 0.
Mechanical downtilt (deg)	Mechanical downtilt in degrees relative to the vertical plane. The tilt angle is fixed and set when the antenna is mounted. Range: -90 to 90. Default = 0.
Height AGL (m)	Antenna height in meters above ground level. Range 0 - 600. Default = 25 meters.

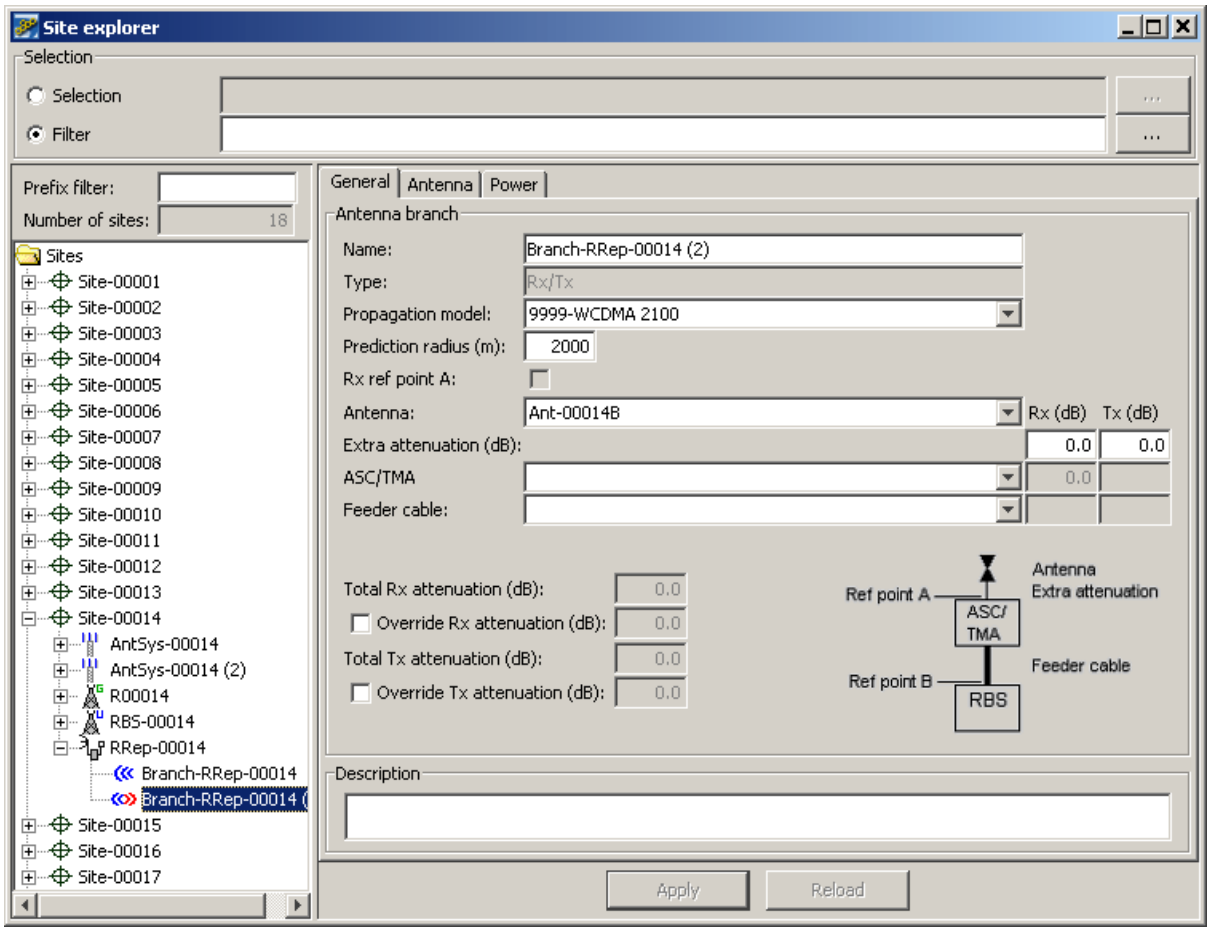
Ground height (m)	Antenna height in meters above the 0 (zero) level of the elevation map. If you set this to a value other than 0, you override the elevation map at this position. Range 0 - 600. Default = 0.0.
Gain unit	Type of gain unit used by the antenna
Description	Description of the antenna type.

Add Radio Repeater Service Antenna Branch

Use this procedure to add or change settings of a radio repeater service antenna branch.

Window to Use

Use the **Radio repeater antenna branch - General** tab to add or change settings of a radio repeater service antenna branch:



Fields on Window "Antenna branch"

Name	Name of the antenna branch. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Antenna branch ID (RDN)	Relative distinguished name (RDN) used to identify the antenna branch
Branch name	Name of the antenna branch. The characters *A* and *B* indicate branches. The second antenna branch in a sector must have the same value as the first. Default = A.

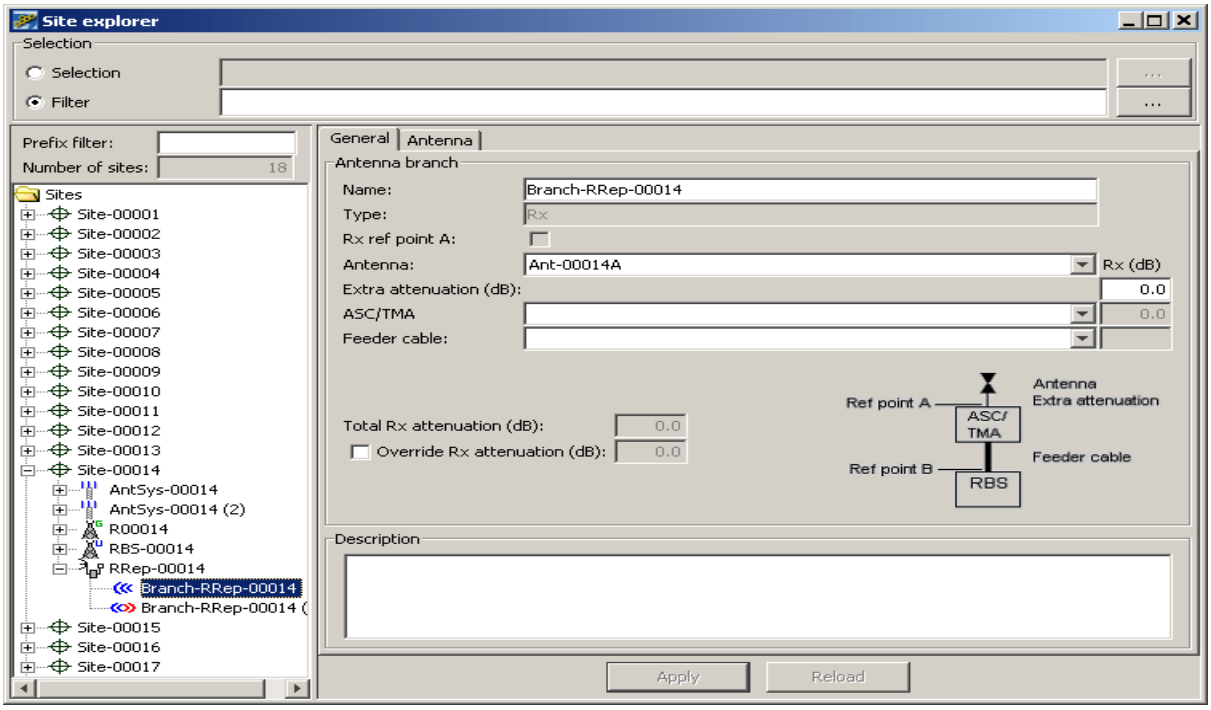
Type	Type of transmission of the antenna branch: • Rx • Tx • Rx/Tx Default = Rx/Tx
Propagation model	Propagation model used for the service antenna branch. As radio repeaters can be located far from a cell, it is motivated to use a separate propagation model for its antenna branch.
Prediction radius (m)	Prediction radius in meters for the antenna branch. Range: 0 - 200000. Default = 2000.
Hexagon radius (m)	Hexagon radius in meters for the antenna branch.
RX ref point A	Indicates the antenna branch uses reference point A for receiving, the Integration reference point of the antenna branch.
Antenna	Type of antenna used with the antenna branch
Extra attenuation (dB)	Extra UL and DL loss values in decibels, added to the **Total Rx attenuation** and **Total Tx attenuation** respectively. Range 0 - 50. Default = 0.
ASC/TMA	Antenna system controller (ASC)/Tower mounted amplifier (TMA) type used with the antenna branch
Feeder cable	Feeder cable type used with the antenna branch
Total Rx attenuation (dB)	Total UL attenuation in decibels, summed up by attenuation contributions from all equipment in the antenna branch. Not used if **Override Rx attenuation** is selected. Range: 0 - 100. Default = 0.
Override Rx attenuation	If selected, the associated attenuation value overrides the **Total Rx attenuation**. Range: 0 - 100. Default = 0.
Total Tx attenuation (dB)	Total DL attenuation in decibels, summed up by attenuation contributions from all equipment in the antenna branch. Not used if **Override Tx attenuation** is selected. Range: 0 - 100. Default = 0.
Override Tx attenuation	If selected, the associated attenuation value overrides the **Total Tx attenuation**. Range: 0 - 100. Default = 0.
Description	Description of the antenna branch

Add Antenna to Radio Repeater Service Antenna Branch

Use this procedure to add or change antenna settings for a radio repeater service antenna branch.

Window to Use

Use the Radio repeater antenna branch - Antenna window to add or change antenna settings for a radio repeater service antenna branch:



Fields on Window “Antenna”

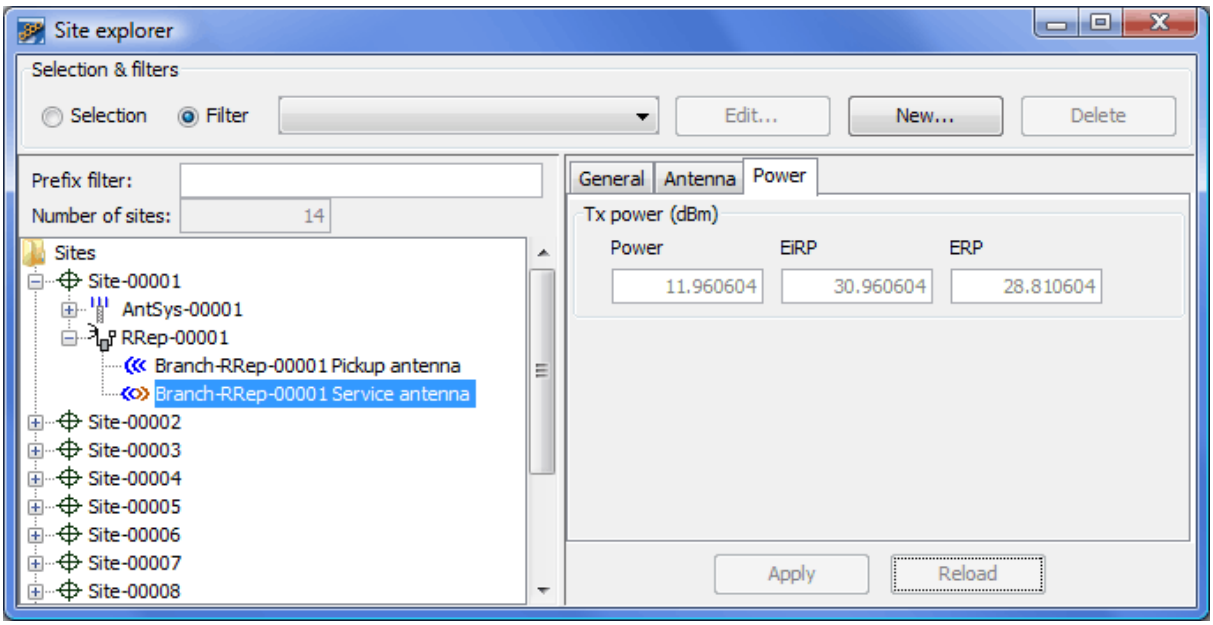
Name	Name of the antenna type. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Type	The type of antenna
Electrical downtilt	The angle of electrical downtilt for the antenna. Calculated by the system.
Azimuth (deg)	Beam direction in degrees, calculated clockwise from north. Range 0 - 360. Default = 0. Calculated by the system.
Mechanical downtilt (deg)	Mechanical downtilt in degrees relative to the vertical plane. The tilt angle is fixed and set when the antenna is mounted. Range: -90 to 90. Default = 0.
Height AGL (m)	Antenna height in meters above ground level. Range 0 - 600. Default = 25 meters.
Ground height (m)	Antenna height in meters above the 0 (zero) level of the elevation map. If you set this to a value other than 0, you override the elevation map at this position. Range 0 - 600. Default = 0.0.
Gain unit	Type of gain unit used by the antenna
Description	Description of the antenna type.

View Radio Repeater Service Antenna Branch Power

Use this procedure to change power values for a service antenna of a radio repeater antenna branch.

Window to Use for GSM Repeaters

Use the **Radio repeater antenna branch - Power** window to view power settings for the antenna. The values displayed are generated during pathloss calculation:

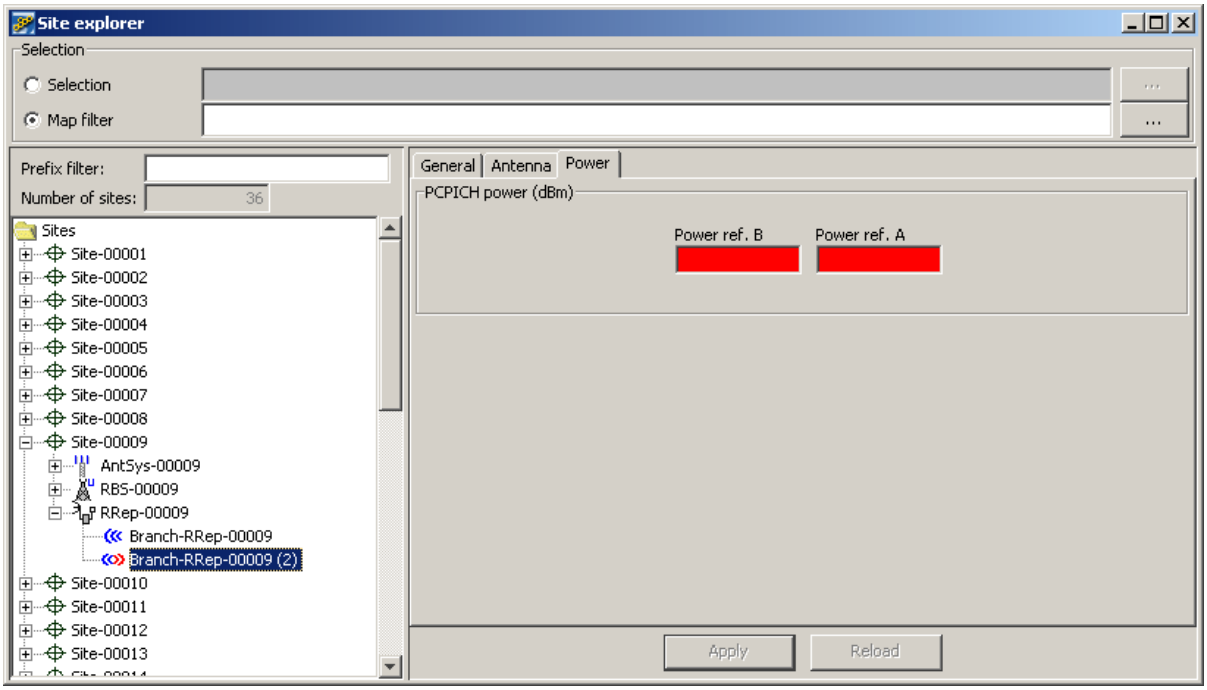


Fields on Window “Power” for GSM Repeaters

Power	Transmission (Tx) power in dBm for the antenna. Marked red if pathloss not yet calculated.
EIRP	Isotropic power in dBm for the antenna. Marked red if pathloss not yet calculated.
ERP	Power in dBm for the antenna. Marked red if pathloss not yet calculated.

Window to Use for WCDMA Repeaters

Use the Radio repeater antenna branch - Power window to view power settings for the antenna. The values displayed are generated during pathloss calculations:



Fields on Window “Power” for WCDMA Repeaters

Power ref. B	PCPICH power in dBm at reference point B of the antenna branch. Marked red if pathloss not yet calculated.
Power ref. A	PCPICH power in dBm at reference point A of the antenna branch. Marked red if pathloss not yet calculated.

6
Customizing Attributes for Sites, RBSs and Cells

This chapter describes how to customize attributes and apply them to sites, RBSs, and cells in a network plan.

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About Custom Attributes and Flag Types

It is sometimes valuable to define additional parameters to sites, RBSs or cells. For example, you might want to add information about rollout, tuning or upgrade status of a site or RBS, or which team is working on which site.

A *flag type is a user-defined parameter which* you can include as a *custom attribute* of any of the objects in the Custom attributes & Flag types folder.

After you have defined flags for RBSs, cells and sites, they are applied to every occurrence of that object in the project plan You can then select the appropriate flag values for individual objects.

Use customized attributes to define your own attributes and flags for specific objects in a project. The attributes are not used in calculations but can be displayed in some plots. Types of attributes can be:

- Text
- Whole numbers (integers)
- Real numbers (decimal numbers)
- Flags

Custom attributes can contain the following information:

- Name of the attribute
- Text describing the attribute
- Minimum, maximum, and default values for the attribute
- Flag values

The following System explorer objects can have custom attributes:

- Sites
- LTE RBSs and cells
- WCDMA RBSs and UTRAN cells
- GSM RBSs and cells
- WiMAX RBSs, fixed subscribers and cells

Flag Types

A *flag type is a user-defined object which* you can assign to sites, RBSs or cells as a *custom attribute*.

Define Flag Types

Before you can assign custom attributes, you must define the flag type to use as a custom attribute.

Prerequisites

A project is opened.

Procedure

Follow these steps to add a flag type:

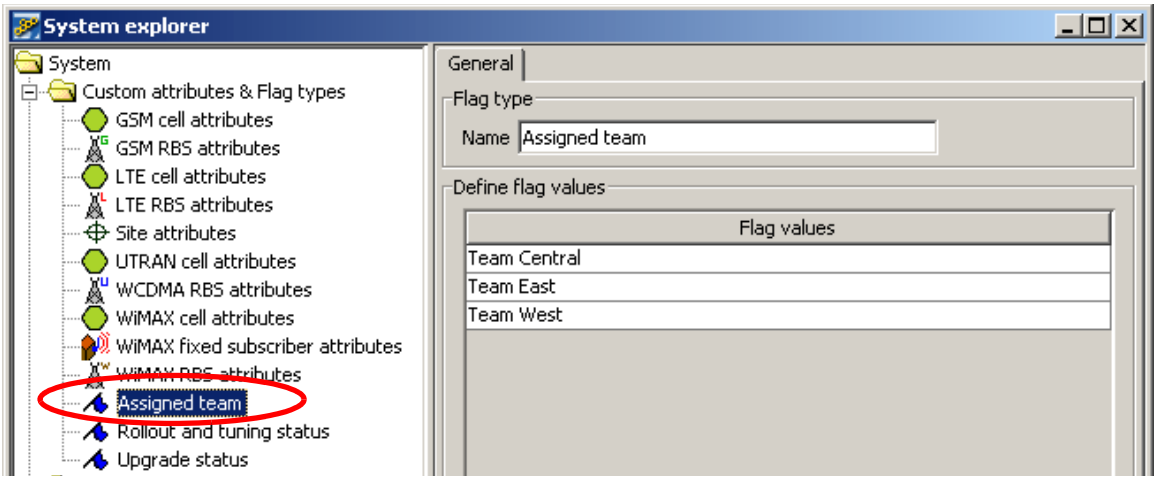
1. Select Utilities↗System explorer.
2. Right-click the Custom attributes & Flag types folder, and select Add Flag type. The Flag type window is displayed.
3. Enter a descriptive Name for the flag type.
4. Define flag values by using the Add, Modify and Remove buttons.
5. Click Apply to preserve the settings.

The flag type may now be included as a custom attributes for any of the attribute objects in the Custom attributes & Flag types folder.

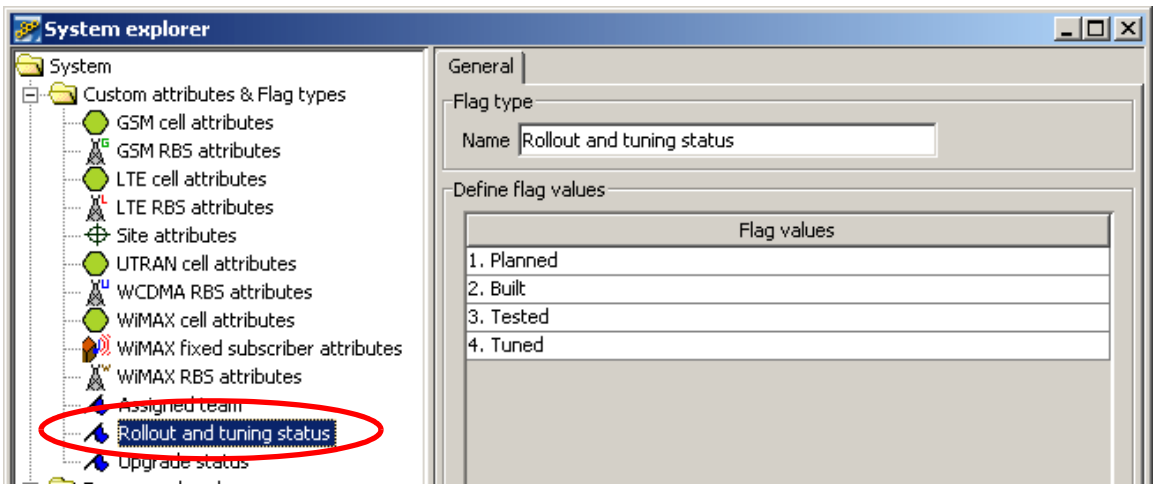
Examples of Flag Types

In the example below, three flag types are defined and visible in the browser tree: *Assigned team*, *Rollout and tuning status* and *Update status*.

The screenshot below shows the possible values of flag type *Assigned team*:



The screenshot below shows the possible values of flag type *Rollout and upgrade status*:



Fields on Window "Flag type"

Flag type	Name of the flag type. Maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.
Flag values	Values to associate with the flag. You can have any number of values for each flag.

Apply Flag Types to Network Objects

Use this procedure to apply flag types as custom attributes to RBSs, cells, or sites.

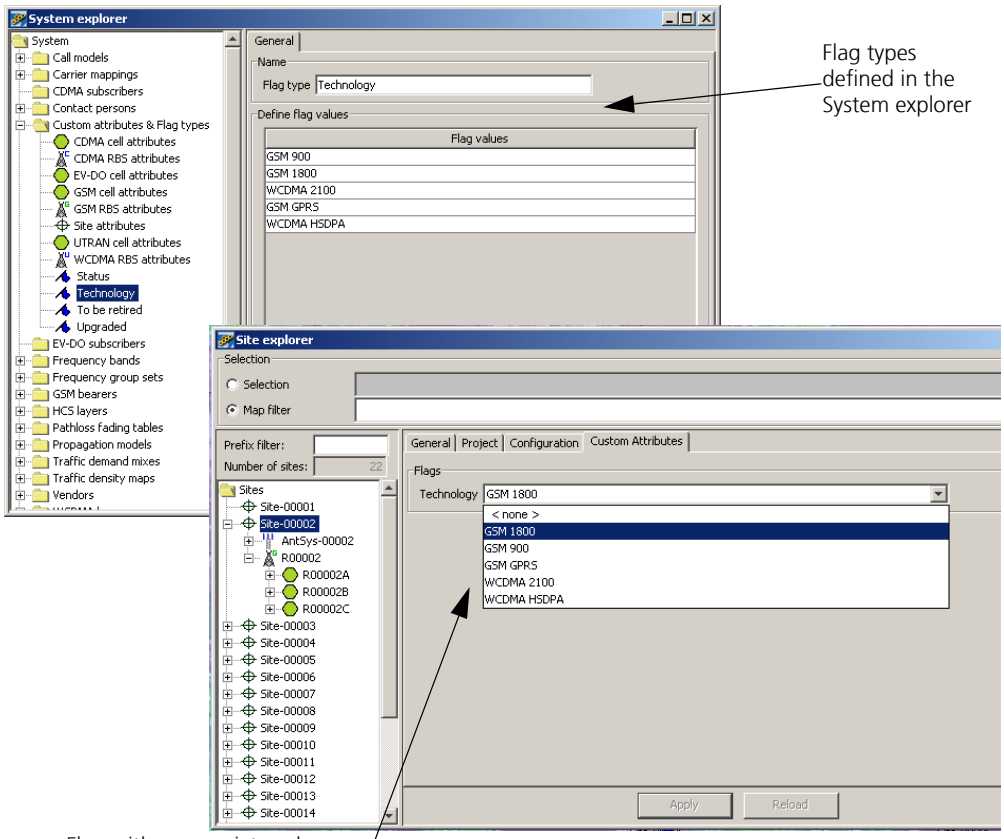
Prerequisites

Flag types are defined in the project.

Procedure

Follow these steps to add flags to RBSs, cells, and sites

1. Select **Utilities↗Site explorer**.
2. Right-click the network object to which you want to set the flag values, and select **Add Flag type**. The **Flag type - General** window is displayed:



3. Modify information as required, and click **Apply** to preserve the settings.

Custom Attributes

You can use custom attributes in the following templates:

- Site template
- LTE RBS and cell template
- WCDMA RBS and cell template
- GSM RBS and cell template

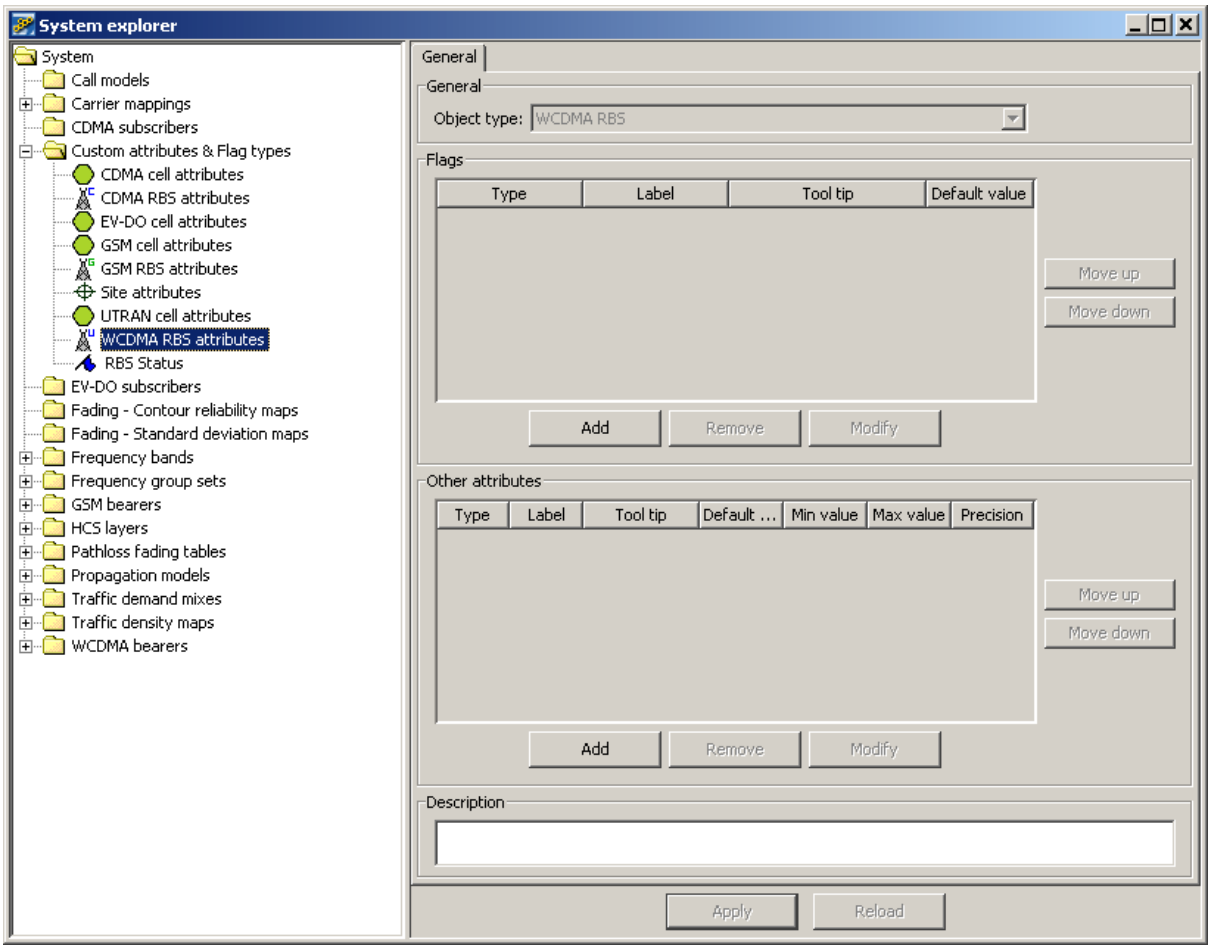
Custom attribute values defined for objects created from a template are copied to the corresponding objects in the network plan.

Define Custom Attributes

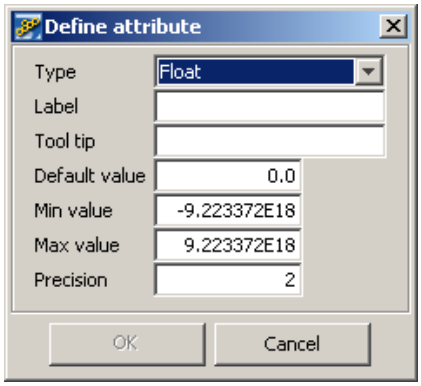
Follow these steps to define custom attributes:

1. Select Utilities↗System explorer.
2. Expand the Custom attributes & Flag types folder.

3. Highlight the network object for which you want to create an attribute:



4. In **Other Attributes**, click **Add**. The **Define attribute** window is displayed, as shown in the following example:



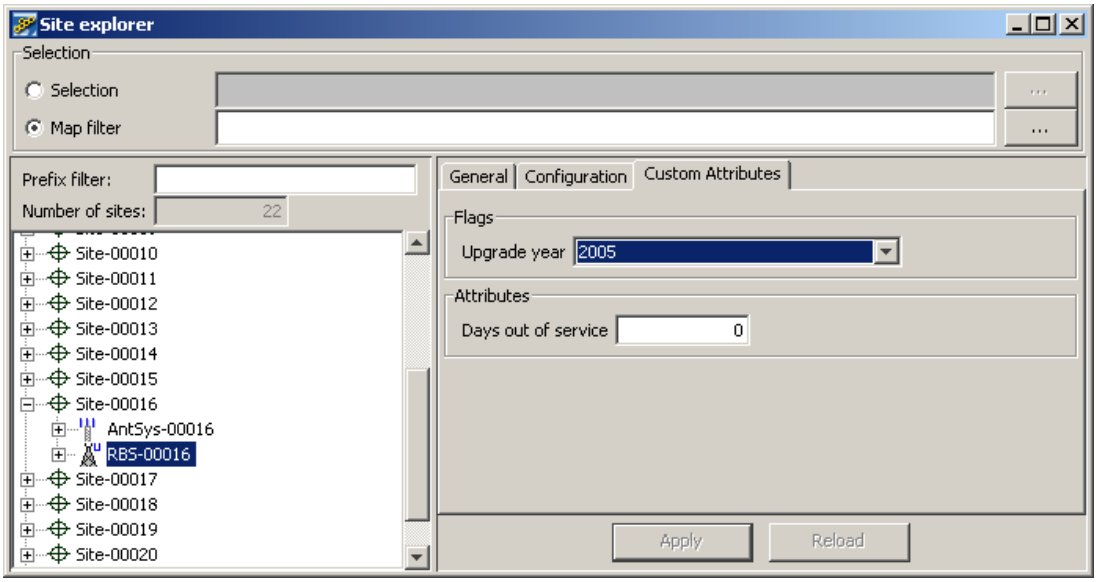
5. Configure the attribute:
   - **Type** - Text, integer, or decimal number
   - **Label** - Name of the attribute
   - **Tool tip** - Description appearing with mouse over on attribute in map
   - **Default value**
   - **Min. value** - Minimum value for a decimal (float) or integer number
   - **Max. value** - Maximum value for a decimal (float) or integer number
   - **Precision** - Number of decimals to display for a decimal (float) attribute
6. Click **OK**.

Modify Custom Attributes of Network Objects

When you define custom attributes specific network object, the attributes are displayed in the **Custom attributes** window. You can add or change values for custom attributes for individual occurrences of objects.

Follow these steps to define custom attributes:

1. Select **Utilities↗Site explorer**. Select one or more RBSs, cells, or sites.
2. Click the **Custom attributes** tab. The **Custom attributes** window is displayed, showing the custom attributes defined for the network object.



The **Attributes** field contains all attributes defined for the network object.

3. For each attribute, enter an appropriate value for this object instance.

   In this example, the **Days out of service** attribute is an integer (number) and you can enter the number of days that the individual RBS is out of service.
4. Click **Apply** to preserve the custom attribute values.

Custom Attributes in Plots

The custom attributes plots allow you to display custom attributes information in map window of TEMS CellPlanner.

The following plots are available to display the custom attributes:

Plot	Description
Sector plot	A sector plot associated with the network layer allows you to display custom attributes using a sector symbol with various colors representing different values.
Attribute plot	An attribute plot based on the best server calculation results plot allows you to associate an attribute with a coverage area.

Custom Attributes Sector Plot

A sector refers to the sectors used in network layer for representing the antenna beam width of the associated antenna branch of a cell. You can display attributes defined on cell objects in a separate layer in the map window. The color of the sector represents the attribute value.

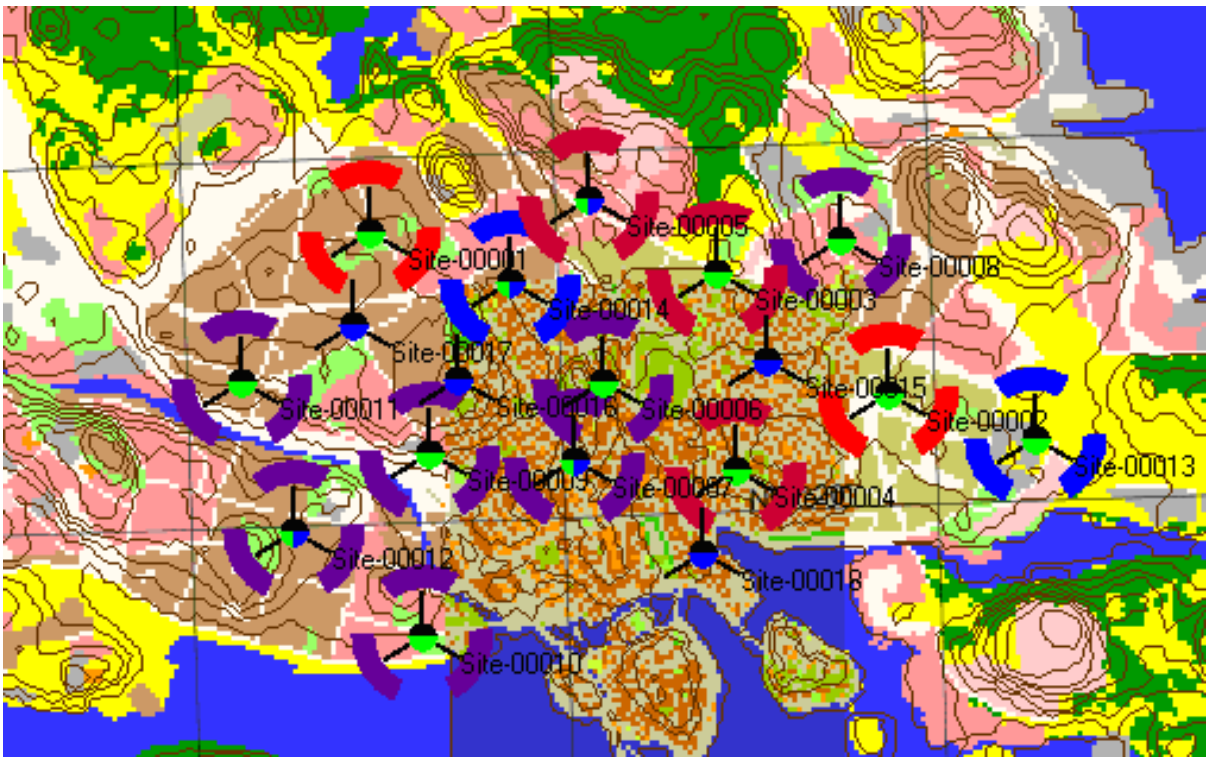
You can display one decimal or integer attribute at a time. You can select the attribute from a list containing all defined decimal or integer custom attributes on a cell object. For displaying values you can define a set of intervals with corresponding threshold levels and have a display color associated with each interval.

You can specify the minimum and maximum values, and the number of intervals between minimum and maximum. The application defines the corresponding threshold levels and assigns colors to each interval.

When you drag the mouse over a sector in map display, the actual value is displayed in status bar.

Example of Sector Plot

The following example of the sector plot shows attributes represented in colors:



Custom Attributes Best Server Plot

The custom attributes best server plot is based on best server calculation results. It allows you to display attributes defined for cells in the area where the cell is best server.

You can display only one attribute at a time and the attributes can be only decimal or integer numbers. Before you generate the plot, you select the type of attribute to display.

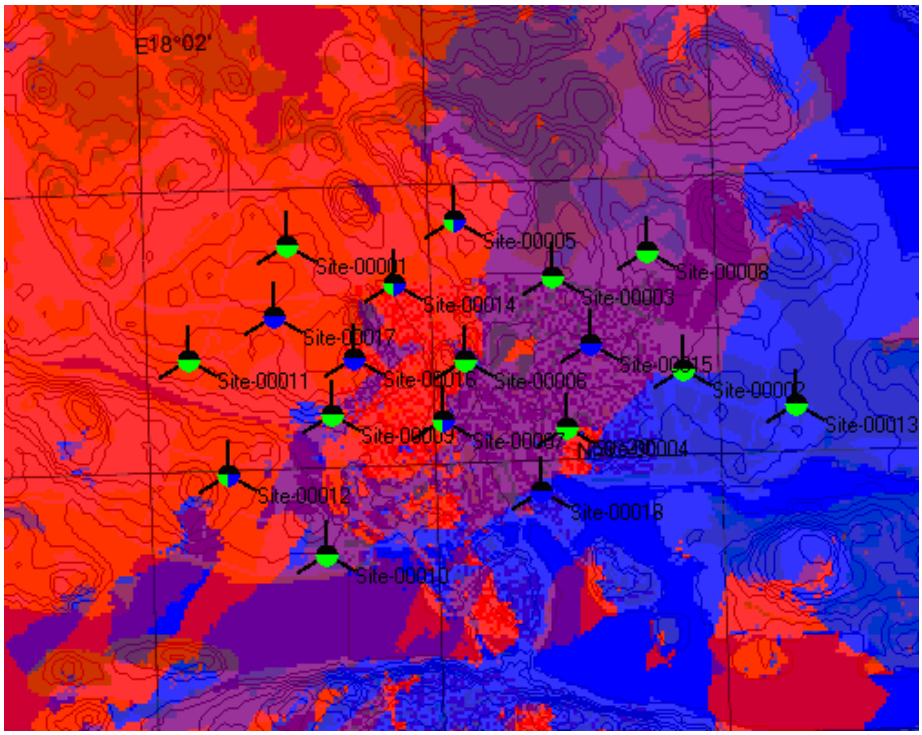
You can define a set of intervals with threshold level colors associated with each interval. The attribute is displayed in the area where the cell is best server and represents the corresponding the value.

When you drag the mouse over a sector, the custom attribute value is displayed in the status bar, along with the cell ID associated with the value.

If you select a cell attribute display on a best server plot for a certain GSM terminal and bearer, then the plot displays only the values for those cells supporting the bearer.

Example of Text Plot

The following example shows the custom attribute best server plot:



Set the Custom Attribute Display

Use this procedure to define custom attribute options such as text and colors.

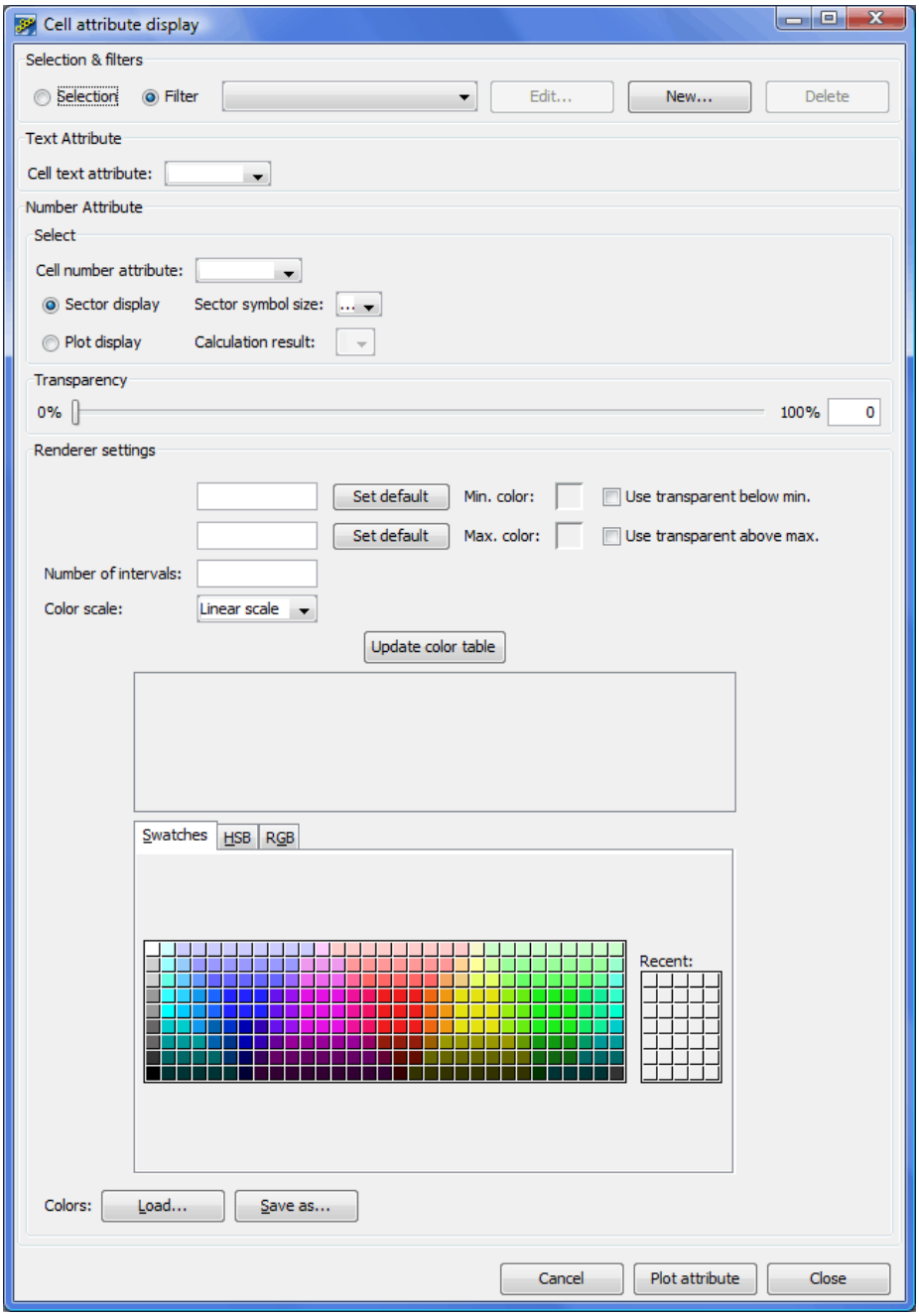
Prerequisite

Best server analysis results must have been generated.

Procedure

Do as follows to set custom attribute plot display options and generate the plots:

1. Select **Utilities↗Attribute display** to view the **Cell attribute display** window:



2. Select the cell attribute you want to display in the plots.
3. Select the type of plot, either sector or best server.
4. Change color settings as desired.
5. Click **Plot attribute** to display the plot in the map display window.

Fields on Window "Cell attribute display"

Cell attribute	The cell attribute to use for the plot. Only one attribute type may be selected at a time.
Sector display	Displays sectors in the plot
Sector symbol size	Selects the size of the sector display in the plot
Plot display	Displays the plot in the map display window
Calculation result	Since there are several best server result based on terminals and bearers the user must additionally select which best server result to be used for the attribute plot. A list shall then be provided containing all best servers by cell results.
Transparency	Allows you to set the transparency of the attribute data in the plot
Min. value	Minimum value of the bins in the plot.
Set default	Set the minimum value as the default for plots of this type.
Min. color	The color representing the minimum value.
Use transparent below min.	Make plot transparent for bin values below the minimum.
Max. value	Maximum value of the bins in the plot.
Set default	Set the maximum value as the default for plots of this type.
Max. color	The color representing the maximum value.
Use transparent above max.	Make plot transparent for bin values above the maximum.
Number of intervals	Interval between the minimum and maximum values used to determine the colors in the plot
Color scale	Options include: • Linear scale • Linear hue • Linear saturation • Linear brightness
Update color table	For displaying values you can define a set of intervals with corresponding threshold levels and have a display color associated with each interval. Updates the table according to the minimum and maximum value and colors, and number of intervals. Options include: • Min. value • Max. value • Color • Swatches • HSB • RGB
Colors: Load	Loads saved color settings from a file.
Colors: Save as	Saves color settings to a file.
Plot attribute	Displays the attribute plot in the map display window

7
Adding Sites and Determining Site Locations

This chapter describes how to manage sites, and the concept of antenna systems and antenna branches.

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Sites

In TEMS CellPlanner, a site represents a location with a name, address, and geographic coordinates. RBSs, RNCs, BSCs and antenna systems (and their subelements including sectors, cells, antennas, antenna branches) are always related to specific sites. The sites are configured in the Site explorer.

A radio network typically includes RBS sites, optionally also radio repeater sites, and in LTE or WiMAX networks there may also be fixed subscribers, configured as sites.

An *RBS site* includes antenna and system equipment for a single radio technology, or co-sited equipment from multiple radio technologies.

A *radio repeater site* includes pickup and service antenna equipment used to amplify the radio signals from surrounding RBSs.

You find technology-independent site configuration procedures in this manual, and technology-specific site configuration procedures in the user guides of LTE, WCDMA, GSM and WiMAX.

Adding Sites

You can add sites in three ways: Add Site in Site Explorer, Add Site on Map, or Add Multiple Sites within a defined area.

Add Site in Site Explorer

Use this procedure to add a site in the Site explorer and define the site's antenna height and coordinates.

To can either add an empty site object, or add a site object filled with sub-objects from a site template.

Procedure

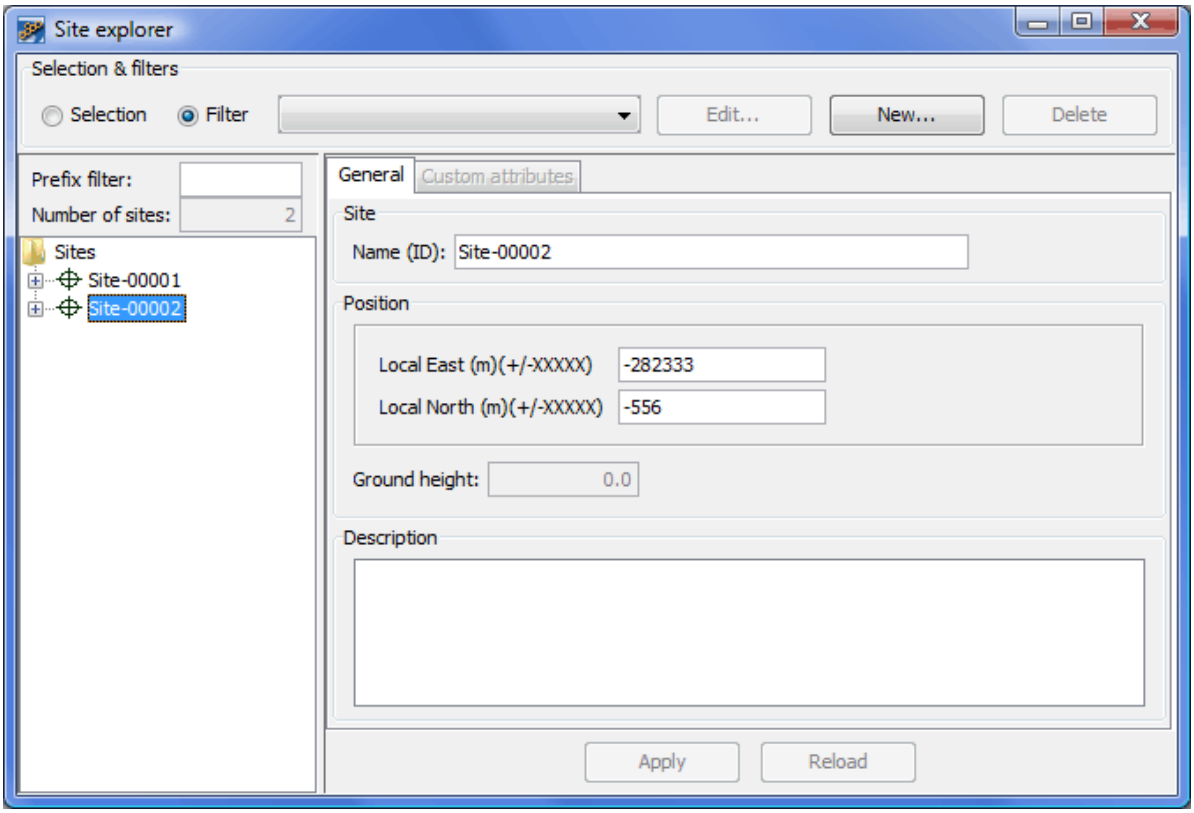
Follow these steps to add a site to a project using the site explorer:

1. Select **Utilities↗Site explorer**.
2. You can add a site with or without a site template.

   In the first case, right-click the **Sites** folder, select **Add Site using, and select the template** from the menu. The site object and all its sub-objects as defined by the template are created.

   In the second case, right-click the **Sites** folder, and select **Add Site. The site object is created.**

In both cases, the new site object is assigned the next available sequence number, and the **General** window is displayed:



3. Enter the **Position** as longitude and latitude coordinates.
4. Enter the **Ground height** above ground level.
5. Click **Apply** to preserve the settings.

Apply Custom Attributes to Sites

Use this procedure to select and apply customized attributes for a site.

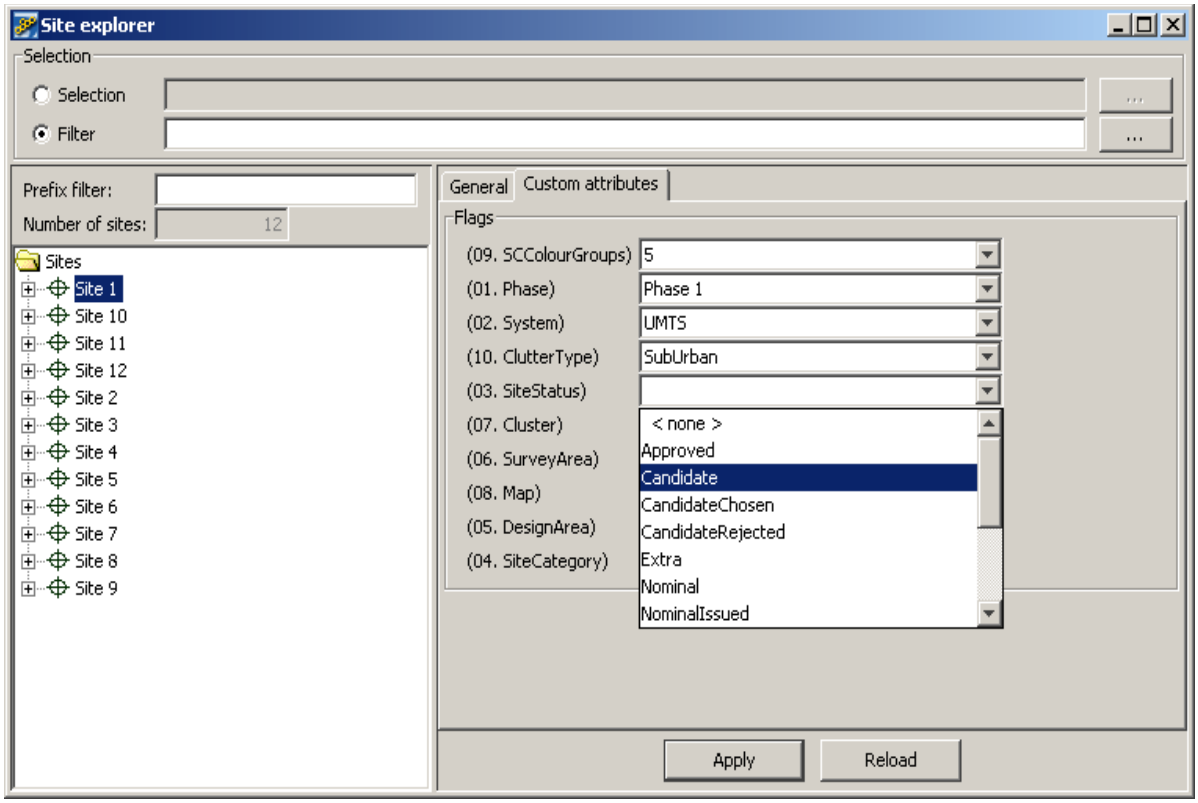
Prerequisites

- The customized attributes are defined as flags with possible values, see Define Custom Attributes.
- The Site attributes network element is added to the Custom attributes & Flag types in the System explorer.
- The appropriate flags are added to the Site attributes.

Procedure

Follow these steps to apply flags as customized attributes to a site:

1. Select **Utilities↗Site explorer**.
2. Select the **Custom attributes** tab. The Custom attributes window with a list of defined flags is displayed:



3. For each flag, select the appropriate attribute value for the site and click **Apply** to preserve the settings.

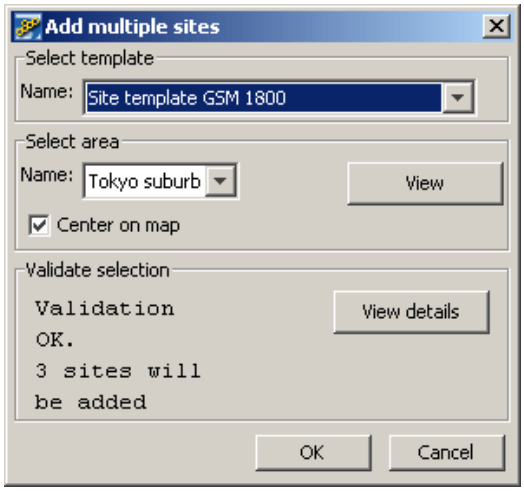
Add Multiple Sites

An alternative to placing sites individually is to distribute sites equally within a designated area to get a rough estimate of coverage. Use this method in areas without existing sites. The new sites are distributed evenly without regard to existing sites.

Procedure

Follow these steps to add multiple sites to a project:

1. In the main window, zoom and pan the area in the window so that the display contains the area in which to distribute sites.
2. Select **Utilities↗Add multiple sites...↗Site <site number>.** The **Area** window appears:



3. Click **Select area for multi addition of sites (visible area)** to fill the **Position** fields with the coordinates of the current view. Change the coordinates, width, and area values as required.
4. Click **OK.** In the map display area, icons appear for all the added sites.

Fields on Window "Add multiple sites"

Select template:	
Name	Site template for adding multiple sites
Select area:	
Name	Area where to place the sites
View	Displays the area on the map where
Center on map	Centers the site location on the map display
Validate selection	Validates the sites added.

Move Sites

Move sites with the Move Site icon .

Prerequisites

Sites are visible in the map display.

Procedure

Follow these steps to move a site on the map display:

1. Click the **Move site** cursor.
2. The cursor changes to a four-arrow cursor. Click and hold the cursor on the site and drag it to its new location. The status area at the bottom of the main window indicates the latitude and longitude of the location to help you to place the site exactly.

   Note: When moving a radio repeater site, ensure that it is still covered by its donor cell. Calculate pathloss, open the site explorer, and observe the power values of the service antenna branch's power values. If the power values turn red, the radio repeater is out of coverage. (The power values are always red before pathloss is calculated, but after running pathloss they should show proper PCPICH power values if everything is OK).

Delete Sites

Delete sites with the selection cursor.

Prerequisites

Sites are visible in the map display.

Procedure

Follow these steps to delete individual sites from a project:

1. Click the selection cursor icon and select the arrow cursor.
2. Click a site icon to select it. The site icon changes from blue to red when the site is selected,
3. Select **Edit↗Delete** to display the **Confirm deletion** window, showing all elements associated with the site.
4. To continue deleting the site and its dependent elements, click **OK**.

Delete Multiple Sites

Delete multiple sites with the rectangle or polygon cursor.

Prerequisites

Sites are visible in the map display.

Procedure

Follow these steps to delete multiple sites from a project:

1. To select multiple sites, use the rectangle or polygon cursor of the selection icon. To outline an irregular area, use the polygon cursor.
2. Drag the cursor to outline the sites to select.
3. After you select the sites, click the second (or third) mouse button to display the menu.
4. Select **Delete selected sites**. The icons for the selected sites are deleted from the map display, and the sites removed from the project file.

Generate Site Installation Report

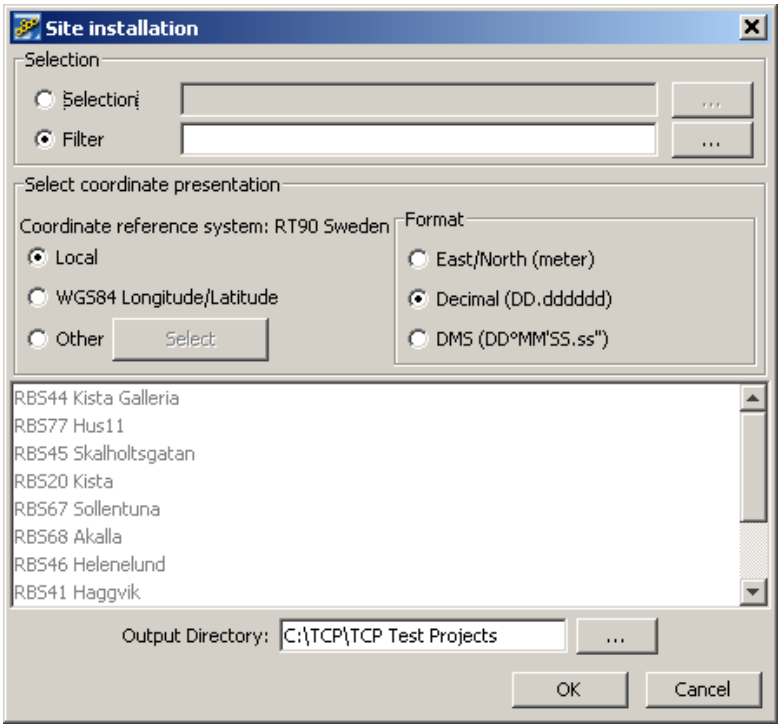
The Site Installation report is a tabbed text file that you can import into MS Excel. The report is produced as a tabbed text file for each site, with the site name as the filename.

Multiple sector and cell configuration entries are reported per site. A site may contain up to six sector configurations, and each sector up to two cell configurations.

Procedure

Follow these steps to display the site installation reports:

1. Select **Reports↗Site Installation**. The window displays a list of sites to be included in the report:



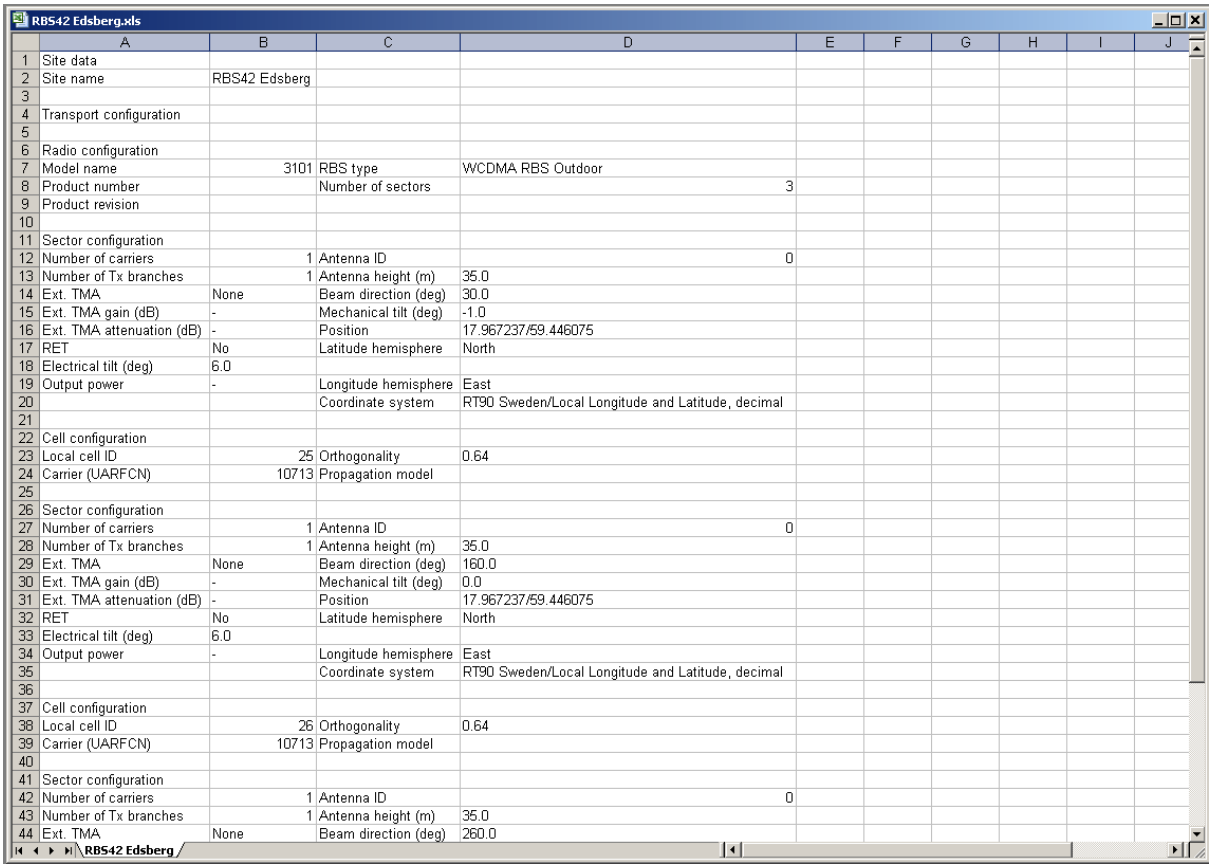
2. Select the directory where to save the report and click **OK**.

   TEMS CellPlanner creates a separate MS Excel spreadsheet report for each site in the directory you selected.

Fields on Window “Site installation”

Reference system	Reference system used with the site data
Format	Format of the longitude and latitude numbering
Output directory	Directory for storing the reports.

Example: Site Installation Report



RBS42 Edsberg.xls

	A	B	C	D	E	F	G	H	I	J
1	Site data									
2	Site name	RBS42 Edsberg								
3										
4	Transport configuration									
5										
6	Radio configuration									
7	Model name	3101	RBS type	WCDMA RBS Outdoor						
8	Product number		Number of sectors	3						
9	Product revision									
10										
11	Sector configuration									
12	Number of carriers	1	Antenna ID	0						
13	Number of Tx branches	1	Antenna height (m)	35.0						
14	Ext. TMA	None	Beam direction (deg)	30.0						
15	Ext. TMA gain (dB)	-	Mechanical tilt (deg)	-1.0						
16	Ext. TMA attenuation (dB)	-	Position	17.967237/59.446075						
17	RET	No	Latitude hemisphere	North						
18	Electrical tilt (deg)	6.0								
19	Output power	-	Longitude hemisphere	East						
20			Coordinate system	RT90 Sweden/Local Longitude and Latitude, decimal						
21										
22	Cell configuration									
23	Local cell ID	25	Orthogonality	0.64						
24	Carrier (UARFCN)	10713	Propagation model							
25										
26	Sector configuration									
27	Number of carriers	1	Antenna ID	0						
28	Number of Tx branches	1	Antenna height (m)	35.0						
29	Ext. TMA	None	Beam direction (deg)	160.0						
30	Ext. TMA gain (dB)	-	Mechanical tilt (deg)	0.0						
31	Ext. TMA attenuation (dB)	-	Position	17.967237/59.446075						
32	RET	No	Latitude hemisphere	North						
33	Electrical tilt (deg)	6.0								
34	Output power	-	Longitude hemisphere	East						
35			Coordinate system	RT90 Sweden/Local Longitude and Latitude, decimal						
36										
37	Cell configuration									
38	Local cell ID	26	Orthogonality	0.64						
39	Carrier (UARFCN)	10713	Propagation model							
40										
41	Sector configuration									
42	Number of carriers	1	Antenna ID	0						
43	Number of Tx branches	1	Antenna height (m)	35.0						
44	Ext. TMA	None	Beam direction (deg)	260.0						

RBS42 Edsberg

Fields in Site Installation Report

Report Category	Report Fields
Site Data	Site Name
	Site Address
	Contact person: • Phone number • E-mail • Address
Transport Configuration	• RBS IP address • NTP server address (primary) • NTP server address (secondary)

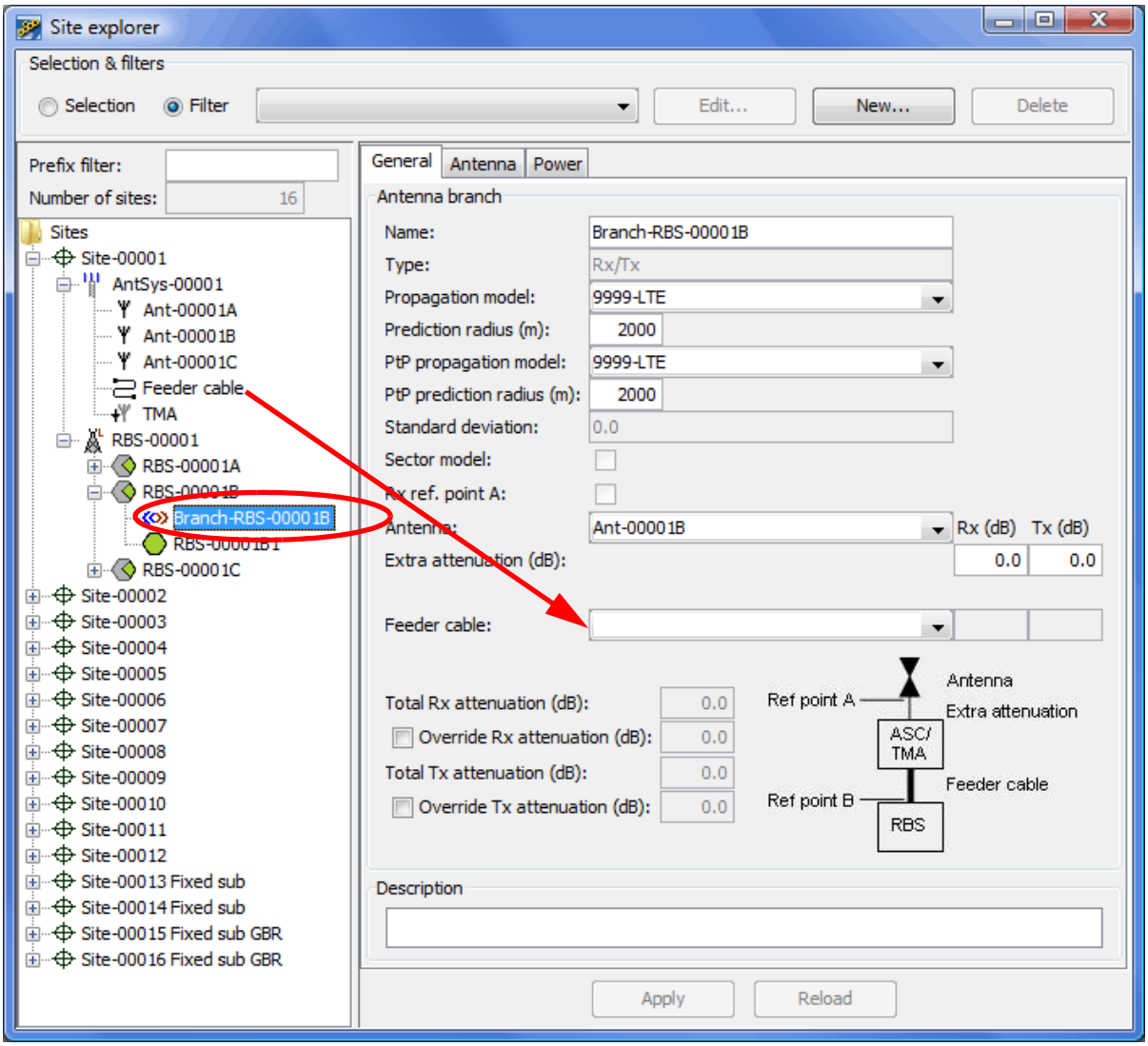
Report Category	Report Fields
Radio Configuration	• Model Name • Product Number • Product Revision • RBS Type • Number of sectors
Sector Configuration	• Number of carriers • Number of Tx branches • Ext. TMA • Ext. TMA gain (dB) • Ext. TMA attenuation (dB) • RET • Electrical tilt (deg) • Output power • Antenna ID • Antenna height (m) • Beam direction (deg) • Mechanical tilt (deg) • Position • Latitude hemisphere • Longitude hemisphere • Coordinate system
Cell Configuration	• Local Cell ID • Carrier (UARFCN) • Orthogonality • Propagation model
Cell Configuration	<next cell>
Sector Configuration	<next sector>

Antenna Systems and Antenna Branches

The antenna-related equipment (antenna, ASC, feeder cable and TMA) of a site is collected in an *antenna system*, which is a mandatory site object, see About Antenna Systems.

The utilization of the antenna system in the site is further refined in antenna branches, defined per transmitting object (sector, cell or radio repeater) in the site, see About Antenna Branches.

The figure below shows the relations between antenna system objects and antenna branch parameters:



About Antenna Systems

RBSs and antennas are interconnected via a certain amount of intermediate equipment. Some examples: The connector between the RBS connection point and the feeder, the feeder itself, the feeder coupler (if any), the power splitter, the TMA, and the connector between feeder and antenna. All this hardware introduces losses and gains and should therefore be defined in the network plan to be considered in the analysis functions.

TEMS CellPlanner uses a container object called *antenna system* to model the antenna-related hardware.

About Antenna Branches

An important input to pathloss calculations is the impact from transmitting equipment, and how radio waves are propagated in the network. All such information (antenna equipment, tilt, tx power, repeater info, propagation model, prediction radius, and so forth) are bunched together in an *antenna branch*.

An *antenna branch* is a configuration object hosted by the transmitting object (cell, sector or radio repeater). The equipment defined in an antenna branch is always fetched from an *antenna system* including all antenna-related equipment of the site.

Most of the antenna branch parameters are the same irrespective of the radio technology of the network plan. There are though some exceptions, hence how to define antenna branches is described in the user guide of the respective technology.

Antenna branch(es) must be defined as sub-objects of the following objects:

- LTE sector - hosts one antenna branch with two propagation models; one for mobile terminals and one for fixed subscriber
- WCDMA sector - hosts one antenna branch and one cell
- GSM cell - hosts one antenna branch and one channel group
- WiMAX cell - hosts one antenna branch with two propagation models; one for mobile terminals and one for fixed subscribers
- Radio repeater - hosts two antenna branches; one pickup antenna branch and one service antenna branch

Add Antenna System to a Site (Create From Template)

Each site must have one antenna system defined, as a container of all its antenna-related equipment.

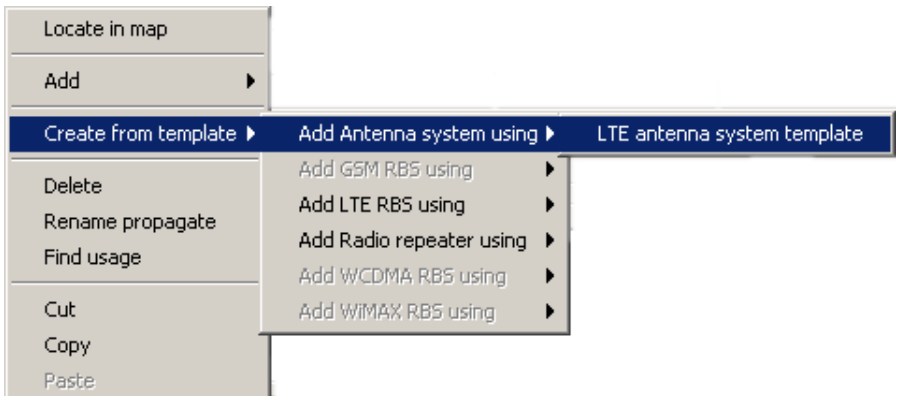
The most efficient way to add antenna related objects (antennas, feeder cables, TMAs, ASCs) to a site is to include those elements in an antenna template and add an antenna system created from that template.

Prerequisites

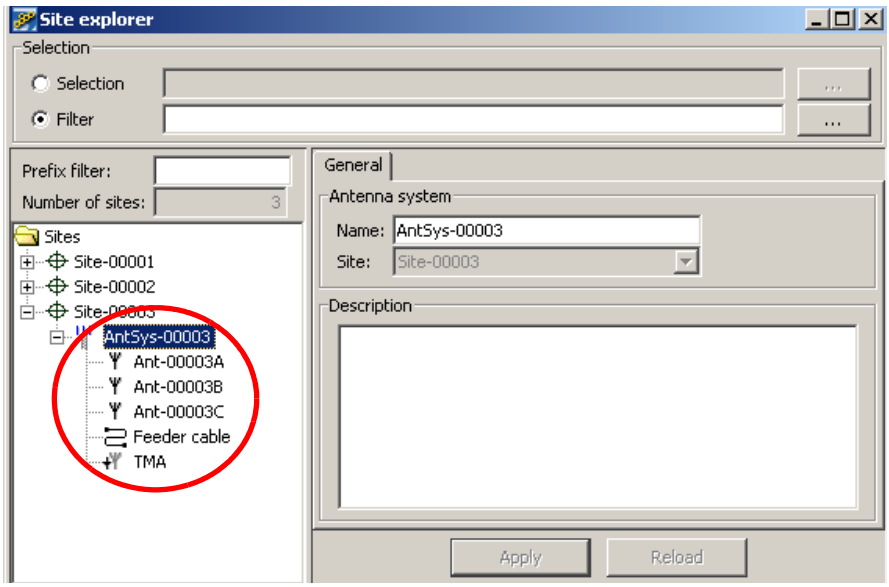
- The site to host the antenna system is defined, see Adding Sites on page 7-2.
- Antenna templates are defined, see Define Antenna System Templates on page 5-67.

Procedure

1. Select **Utilities↗Site explorer**. A list of sites is displayed.
2. Optionally delimit the number of sites by a selection or filter.
3. Locate the site in the browser, right-click on the site, click **Create from template↗Add Antenna system using** and select a template as in the following example:



4. An antenna system object, with equipment defined in the antenna template, is created under the site and the **Antenna system** window appears:



5. Click **Apply** to preserve the settings.

Add Antenna System to a Site (Add Without Template)

Instead of using an antenna template, an antenna system can be added in a more "raw" way to the site. You then add first the antenna system and subsequently all its network elements one by one.

Prerequisites

The site to host the antenna system is defined, see Adding Sites on page 7-2.

Procedure

1. Select **Utilities↗Site explorer. A list of sites is displayed.**
2. Optionally delimit the number of sites by a selection or filter.
3. Locate the site in the browser, right-click on the site and select **Add↗ Antenna system**. An empty antenna system is created under the site.
4. Add network elements to the antenna system: Right-click on the antenna system and select the network element to add, for example **Add antenna**. The network element is created under the antenna system.

Site Tools

This section describes a number of embedded tools to use on sites visible in the map display.

Icons

The toolbars contain site-related icons for managing sites in the network plan.

Icon	Function
Select	Three selection cursors select sites for locating.
Add site	Adds a site at the location of the cursor.
Move site	Moves a selected site.
Show Instant pathloss	Shows instant pathloss for a site based on a loaded elevation map layer and defined 9999 propagation model.
Measure distance	Measures the distance between two locations and displays the results in meters in the status bar.
Line of sight	Uses an elevation map layer and a land use layer, if loaded, along with mobile height and antenna range, to predict areas where user equipment will be in line of sight with the base station.
Terrain profile	Uses an elevation map layer and a land use map layer, if loaded, to show the vertical profile and land use along a line between two points.

Show Instant Pathloss

Knowledge of radio propagation conditions around a site is important for finding the optimal site location and how the site surroundings affect radio signal attenuation. Show instant pathloss obtains all required information on pathloss when you move the cursor around a site to show the best site position.

Show Instant pathloss displays pathloss at any location in the network without having to calculate pathloss for the whole planned area. Show instant pathloss is useful for searching the map database for new site positions. The display may be colored and overlaid on other map information as desired.

To show instant pathloss you must load an elevation map layer. A land use map layer plus data for base stations and user equipment is also used to predict the pathloss between the base station and the equipment.

If you import or change the Z value for a site (ground level above mean sea level), you must use the same elevation model as the model used by the elevation database for predicting pathloss.

Prerequisites

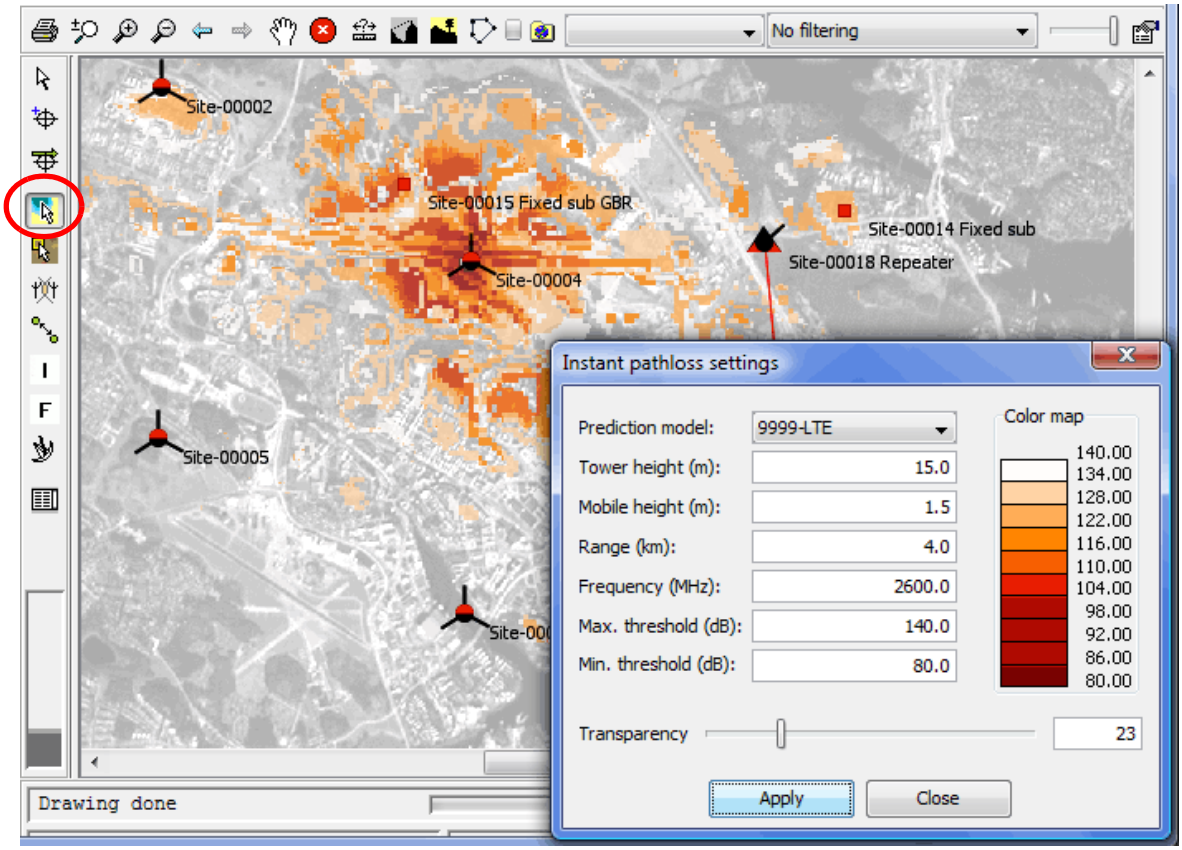
- Load an elevation map layer
- Define a propagation model

Procedure

Follow these steps to show instant pathloss for a site:

1. Click the **Instant pathloss** icon, or select **Analysis↗Show instant pathloss**. The **Instant Pathloss Tool Settings** window appears.
2. Select a propagation model, change other values as required, and click Apply.
3. Click the cursor on a candidate location for a site to display a pathloss display. Use the **Values** color range in the window to interpret the loss.
   The color is paler (and pathloss larger) as the distance increases or obstacles

interfere. The instant pathloss with settings might look as in the example below:



Fields on Window "Instant pathloss settings"

Propagation model	Propagation model to use for showing instant pathloss
Tower height (m)	Height in meters of the tower to use in the pathloss calculation
Mobile height (m)	Height in meters of the mobile to use in the pathloss calculations
Range (km)	Range in kilometers for the pathloss calculations
Frequency (MHz)	Frequency to include in the pathloss calculation. WCDMA pathloss calculations use the downlink frequency.
Max threshold (dB)	Maximum pathloss threshold in dB considered relevant in the final composite result.
Min. threshold (dB)	Minimum pathloss threshold in dB considered relevant in the final composite result.
Transparency	Transparency of the pathloss layer in the display

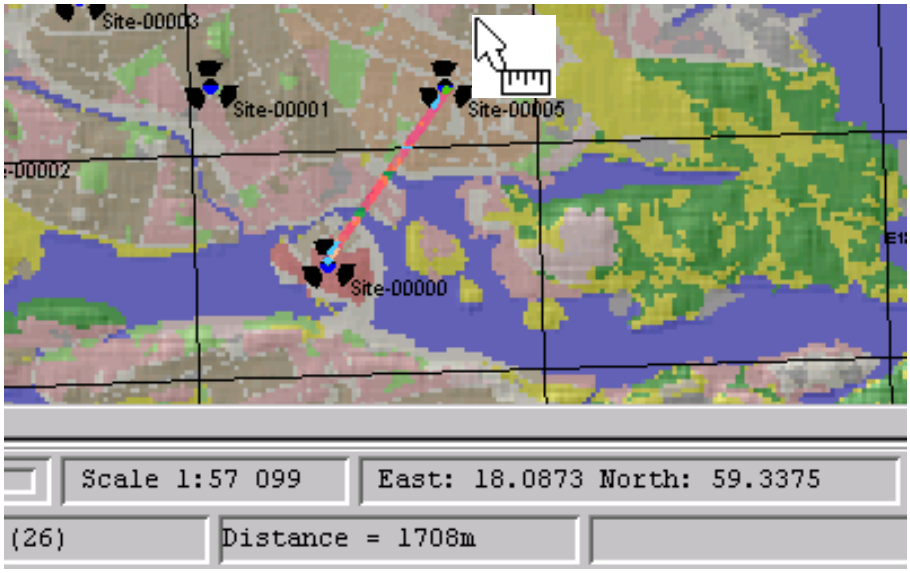
Measure Distance

Use the measure distance function to measure the distance between two locations in the map display.

Procedure

Follow these steps to use the Measure Distance function:

1. Click the **Distance** icon in the horizontal toolbar, or select **Map↗Measure distance...**.
2. The cursor changes to the measurement cursor. Click and hold the cursor on a location in the map and drag the cursor to draw a line to another location. The distance between the two locations is shown in the **Distance** field of the status bar, as shown in the following example.



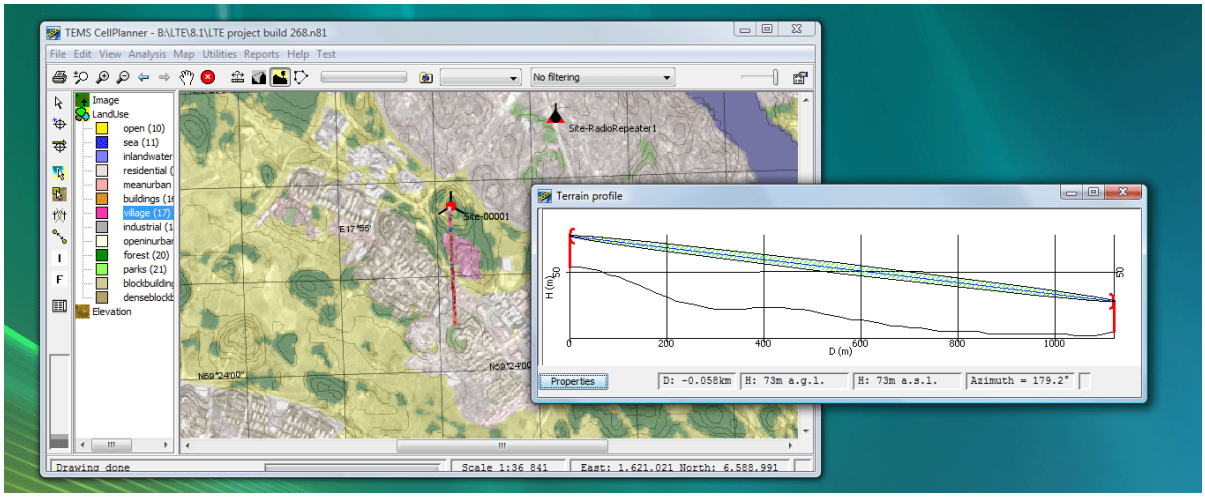
Terrain Profile

A terrain profile shows the path profile between any two points on the map. When analyzing radio propagation and obstacle losses of natural or man-made structures, the terrain profile gives a complete picture of the radio path over the analyzed terrain.

The terrain profile uses the elevation, obstacle, and landuse map layers (if loaded) to show the vertical profile and landuse along a line between two points.

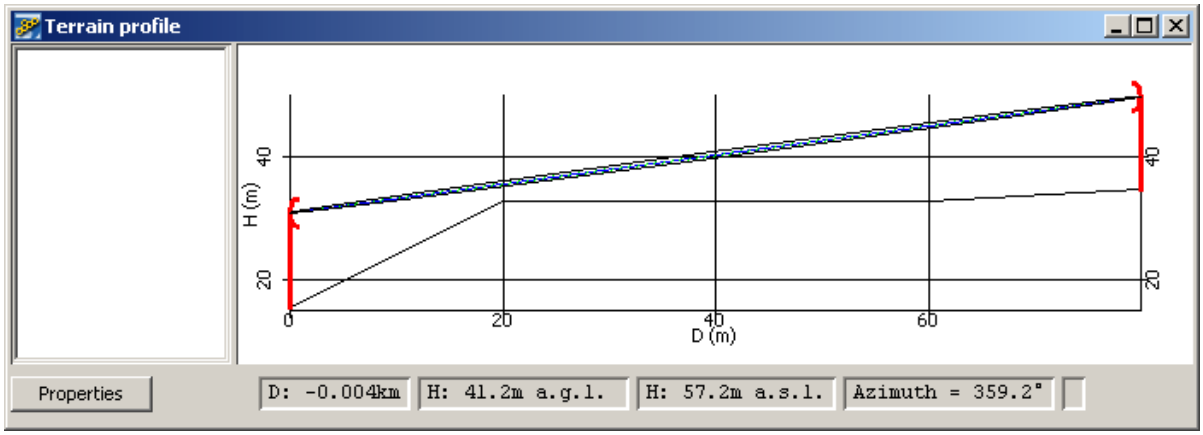
Use the terrain profiler as follows:

1. Select **Map↗Terrain profile...**to open the **Terrain profile** window.
2. Place the cursor in one point (A), hold the left mouse button down and drag the mouse to the other point (B). The **Terrain profile** window shows the terrain between the two points while moving the mouse as in the following example:

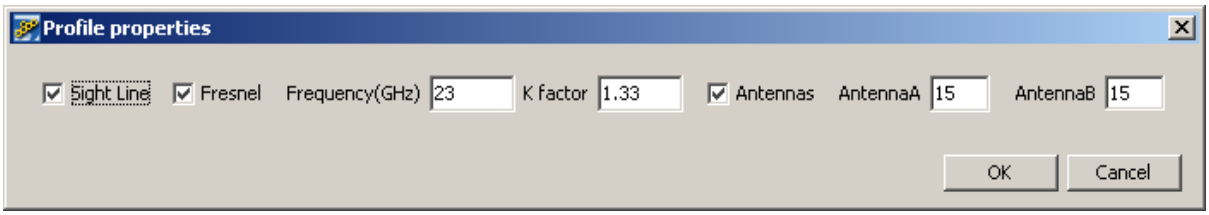


The lower part of the **Terrain profile** window shows the height (H) of antenna A, and how the azimuth of antenna A changes while moving antenna B with the cursor.

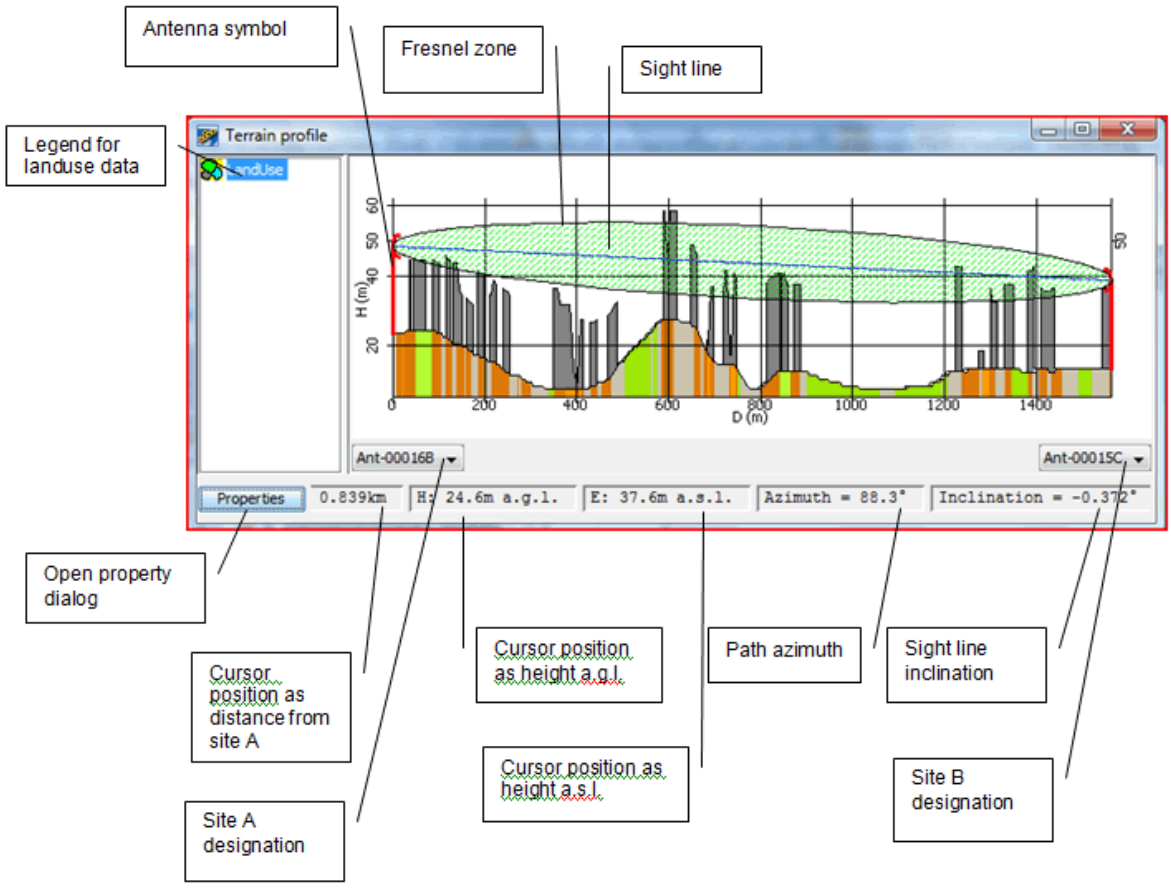
3. Release the left mouse button. The **Terrain profile** window is updated with graphical and textual terrain information (distance A-B, antenna heights A and B, azimuth of antenna A) as in the following example:



4. To simulate how the propagation changes with the frequency, K factor and antenna heights, click **Properties** and change these parameters in the **Profile properties** window:



5. To enable or disable graphical display of line of sight, fresnel zone, antennas and landuse colors, use the same **Profile properties** window. The figure below includes a fresnel zone and a description on all fields.



Fields on Window "Terrain profile"

Sight Line	Shows the direct path from one point to the other.
Fresnel	Displays the first Fresnel zone.
Frequency (GHz)	Used for calculating the Fresnel zone.
K factor	Equal to the effective earth radius (km) / Earth radius (6370 km).
Antennas	Includes Antenna A and Antenna B at the end points in the profile with the specified antenna height values in meters. The elevation must be added to the antenna height to get the actual antenna height above sea level.
Land use	Displays land use information with the terrain profile.

Line of Sight

When placing new base station sites in a mobile radio network, you must determine whether or not the selected location provides suitable radio wave propagation. Placing a site in between major obstacles results in poor coverage and service quality due to negative shadowing effect on radio waves.

The line-of-sight tool helps to locate optimal positions for radio base stations by making an instant analysis of the radio conditions around a selected position. The results is displayed as a colored plot.

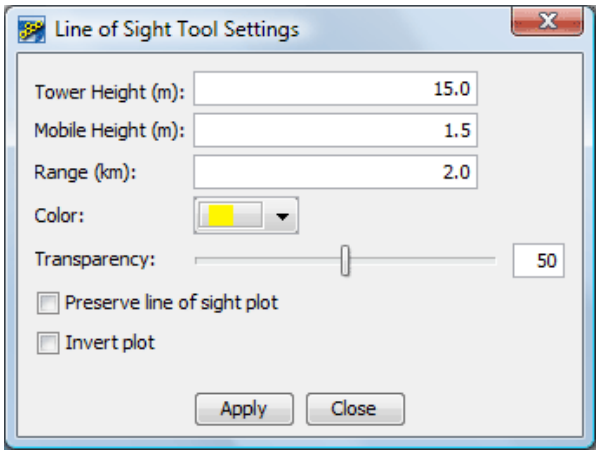
Prerequisites

An elevation map layer is displayed.

Procedure

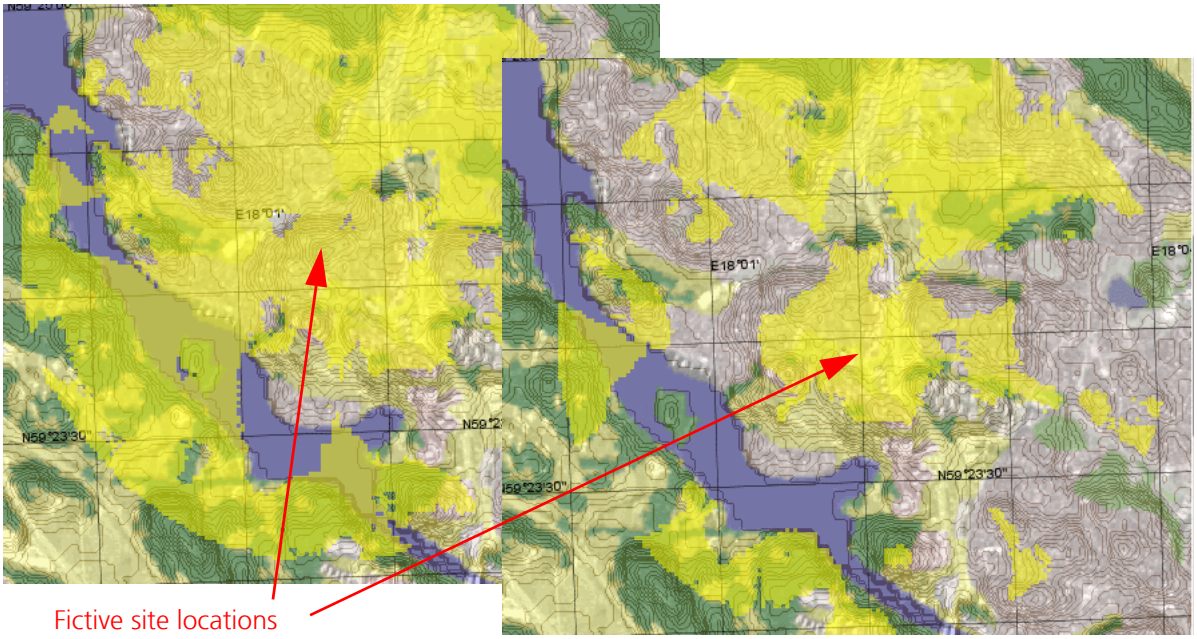
Do as follows to analyze the line of sight from a certain position:

1. Select **Map↗Line of sight...** The **Line of Sight Tool Settings** window is displayed:

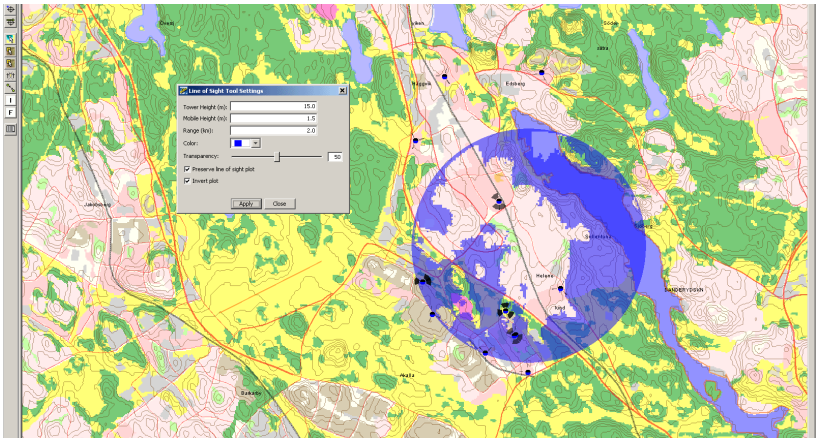


2. Place the cursor in the **map display** where you want to place a site, and left-click. The line of sight from the site is displayed as you move the cursor. The line-of-sight from the fictive site varies with the terrain and obstacles.

3. In the following rural examples the site is first placed on the top of a height curve, then in the valley slightly south-east of the first location:



4. The figure below exemplifies red-colored line-of-sight in an urban area:



5. To modify the display of the line-of-sight you can trim the following parameters in the **Line of Sight Tool Settings**:

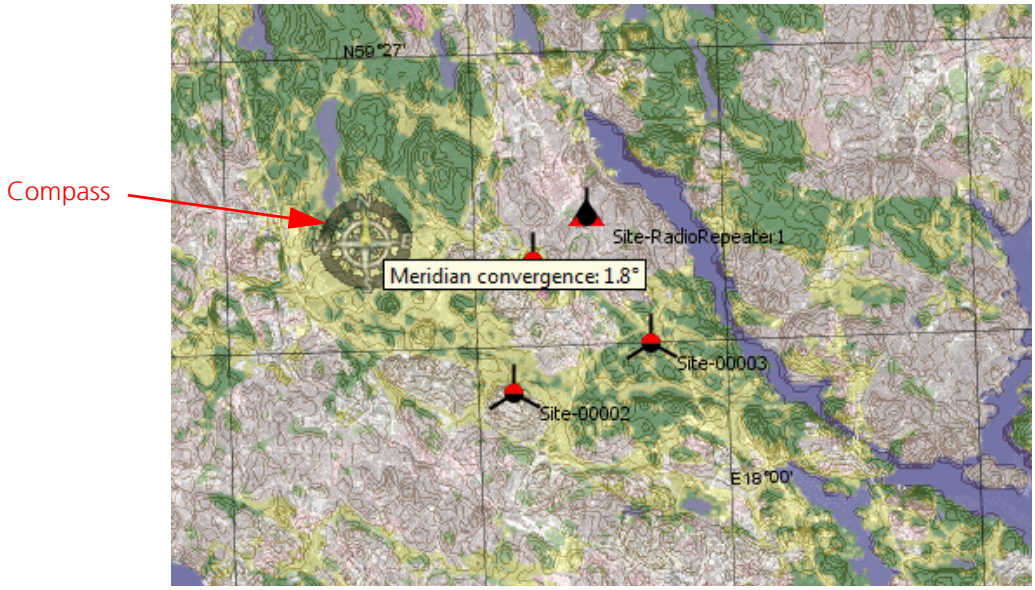
   - **Preserve line of sight plot**: Enable this option to keep the line-of-sight plot in the map display after releasing the mouse button.
   - **Invert plot**: Show areas <u>not</u> covered by the fictive site.
   - **Transparency**: Modify the transparency of this temporary plot.
   - **Color**: The color to use for displaying covered (or not covered) area.

6. Here you can also simulate how the line of sight changes when modifying **Tower height**, **Mobile height** (terminal height) or the transmission **Range**.

Compass

You can show a compass on the map display to get the orientation of the map. The true north is rarely the same as the vertical direction of the map, and the compass rotates towards true north wherever it is positioned.

To display the compass, select **Map↗Compass**. A compass icon is displayed in the center of the map, and you can drag it to any location:



The tooltip shows the actual meridian convergence where the compass is placed. Note that the deviation is not a straight vertical line.

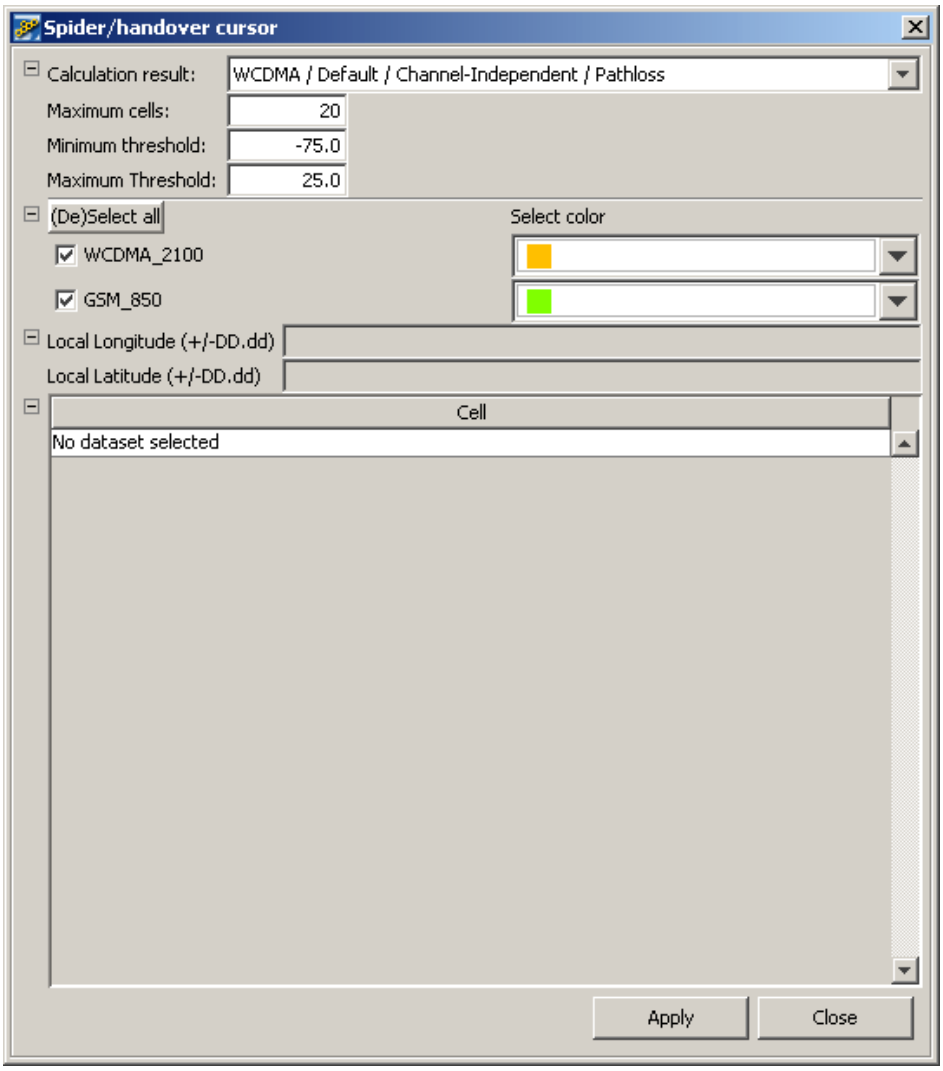
Spider/Handover Cursor

Use this procedure to make adjustments to the spider/handover cursor display and activate the cursor.

Procedure

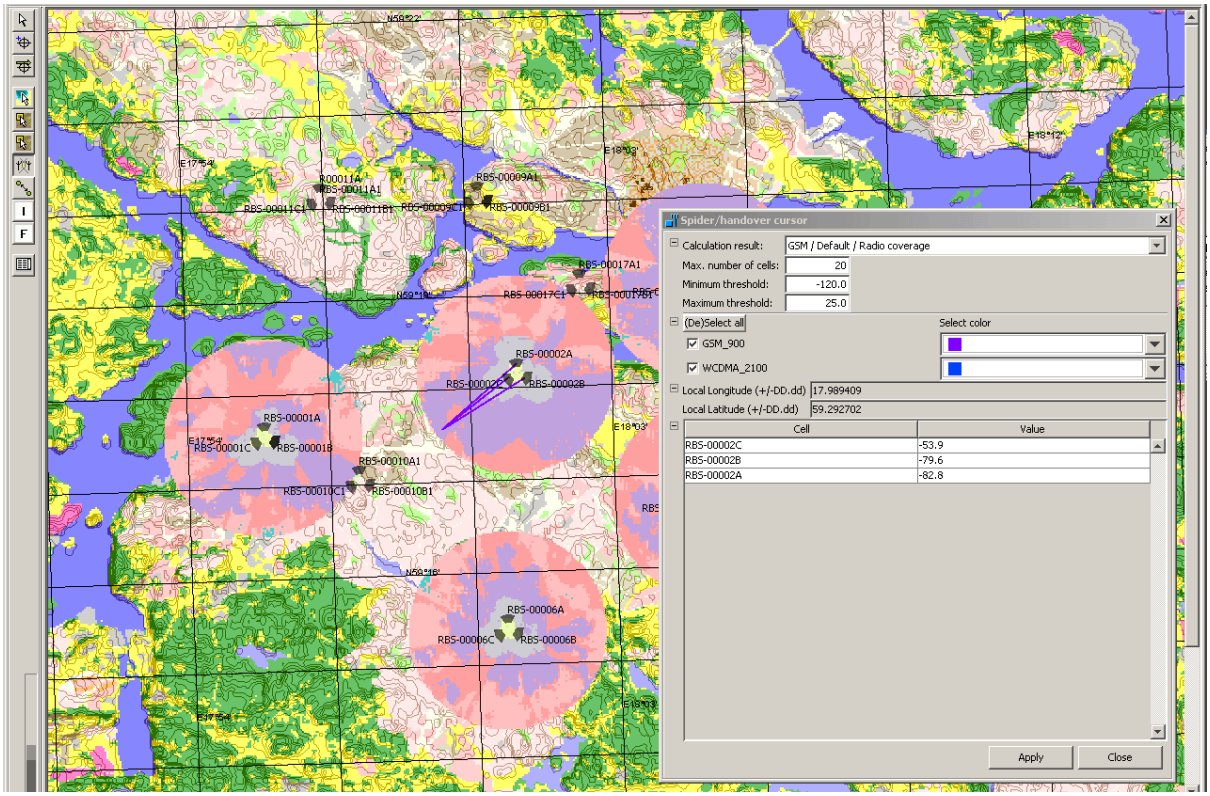
Follow these steps to activate the spider/handover cursor:

1. Select **Analysis↗Handover cursor**. The **Spider/handover cursor** window appears as in the following example:



2. Select the calculation result to use for the display. To show handover in the map display, select a handover calculation result. To use the spider cursor, select a pathloss result.

3. Select the frequency bands to use in the display.
4. Click **Apply**. Press and hold the left mouse button as you move the cursor around the map display. The spider connections are shown on the display as in the following example:



Fields on Window "Spider/handover cursor"

Calculation result	List of calculation results to use in displaying the handover
Max number of cells	Maximum cells visible in the display
Minimum threshold	Minimum signal strength threshold
Maximum threshold	Maximum signal strength threshold
(list of frequency bands)	List of frequency bands available
Select color	Lists colors available for each available frequency band
Local longitude (+/-DD.dd)	Displays longitude of cells shown in map display
Local latitude (+/-DD.dd)	Displays latitude of cells shown in map display
(list of cells)	List of cells shown in map display. List changes when you move the cursor

Antenna Azimuths

You can change the beam direction - the azimuth - of any antenna directly in the map display by using the antenna azimuth editor tool. While this tool is open you can modify multiple antennas.

You can also use explorers to change azimuths in antenna templates or individual antennas per site.

Edit Antenna Azimuths

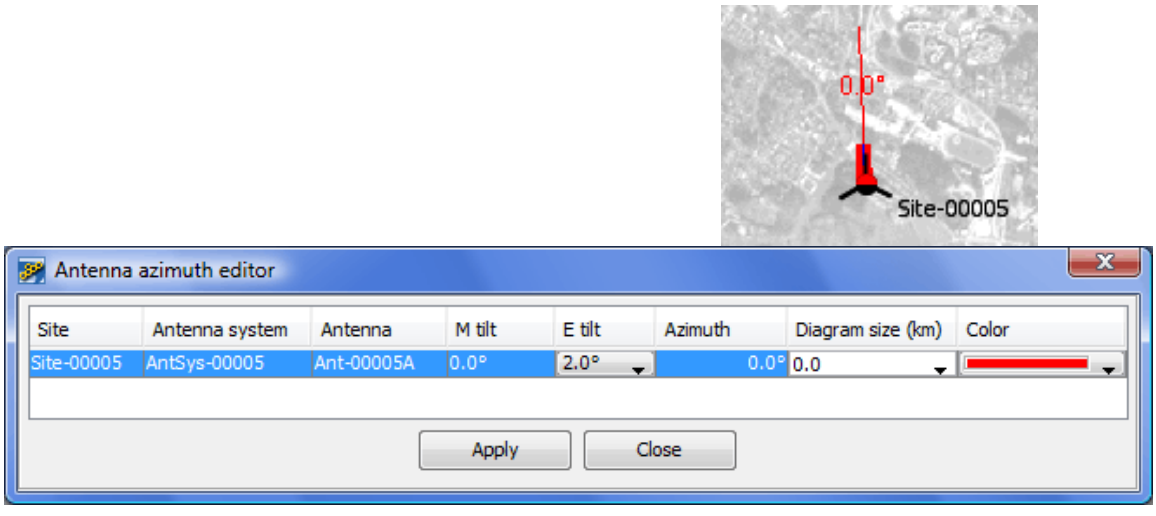
Prerequisites

Antennas are defined, see Antenna Systems and Antenna Branches on page 7-11.

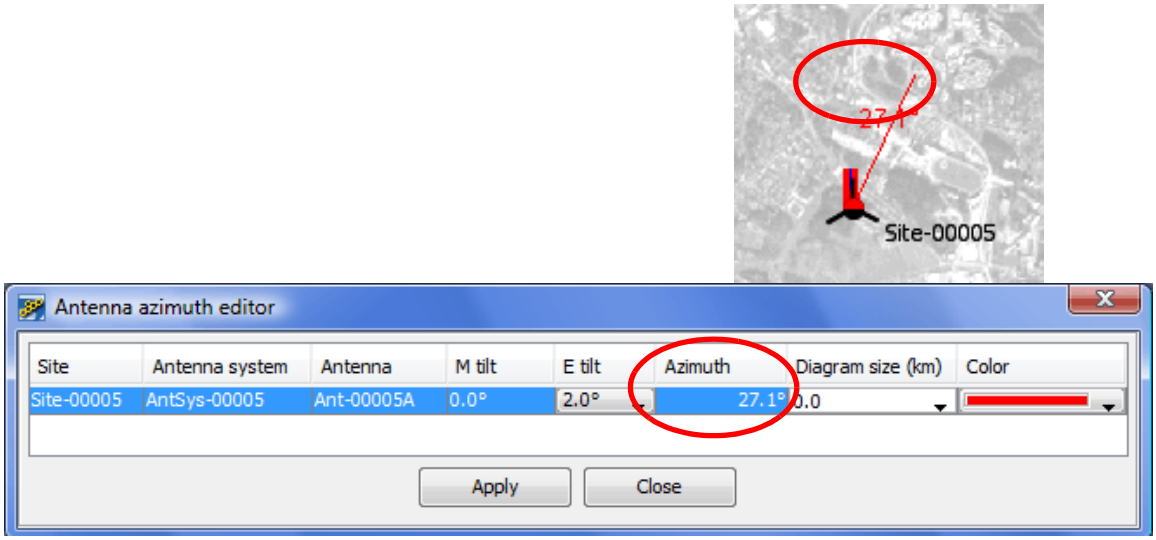
Procedure

Do as follows to edit antenna azimuths:

1. Click on the icon in the vertical tool bar or select **Analysis-Antenna azimuth editor** from the menu bar. The **Antenna azimuth editor** window appears and the cursor takes the same shape as the icon, .
2. In the map display, left-click on the antenna you want to modify. A thick line marks the actual azimuth of the selected antenna. A thinner solid line originating at the base of the antenna marks the direction of the azimuth. A new table row representing the antenna appears in the **Antenna azimuth editor** as in the following example:

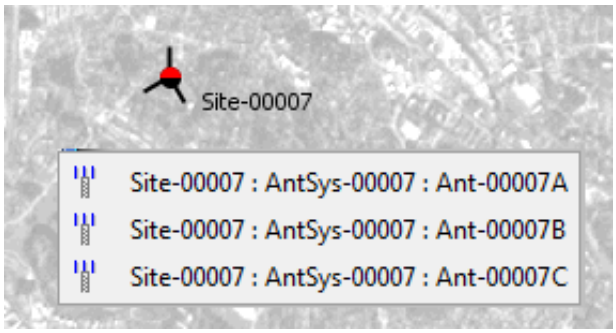


3. Point at the antenna, hold down the left mouse button and move the mouse. The thin azimuth line follows the mouse movements, in angle as well as length. The textual azimuth value is updated accordingly as in the example below.



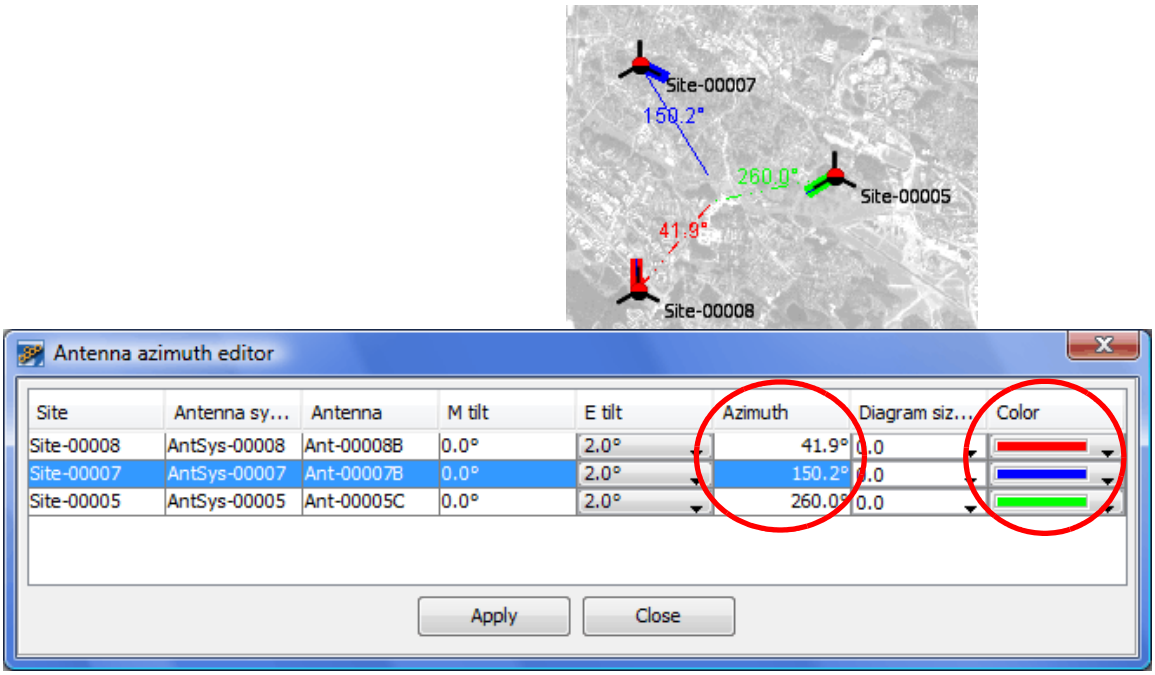
Note: *The azimuth line is tentative until you click* ***Apply****.*

4. Vice versa, you can enter a new azimuth value in the **Antenna azimuth editor**. Press the **TAB** or **RETURN** button to update the azimuth line in the map.
5. If the application cannot distinguish which antenna to select, a popup menu appears where you can refine your selection:



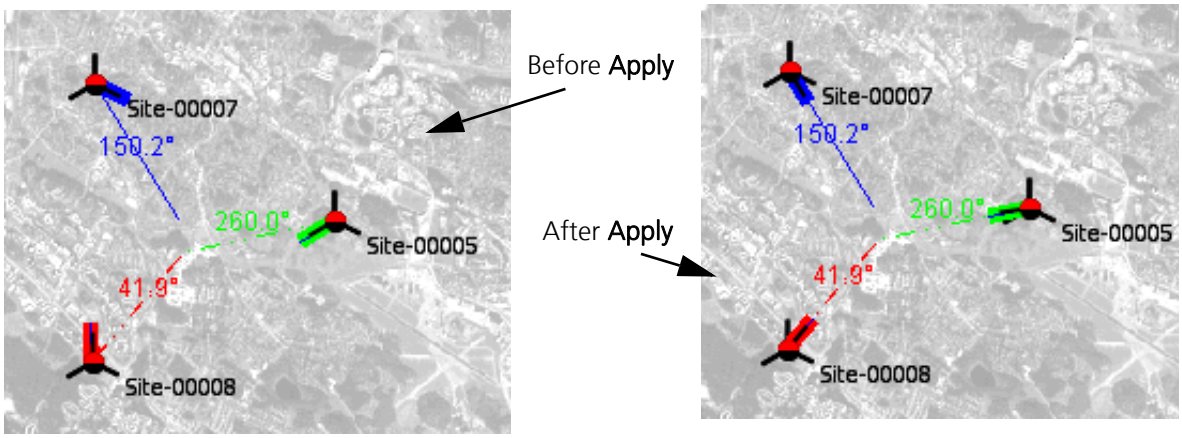
6. To edit more than one antenna, repeat from Step 2.

7. Every new antenna you select appear as a solid line, and as a new row in the **Antenna azimuth editor**. Azimuth lines of other antennas become dashed and dotted. Enhance the visibility by changing the color of individual antenna lines:

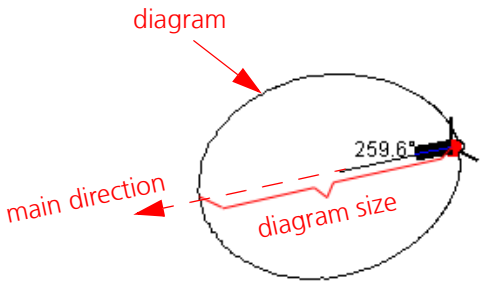


8. To delete an antenna from the **Antenna azimuth editor**, select the antenna and press the **DEL** button. The selected row and the corresponding line disappear.

9. When you are satisfied with your changes, click **Apply**. The new azimuth values are preserved in the antenna configuration, and the thick lines are moved as in the example below:



Columns in "Antenna azimuth editor"

Site	Name of the site hosting the antenna. Read-only.
Antenna system	Name of the antenna system hosting the antenna. Read-only.
Antenna	Name of the antenna. Read-only.
M tilt	The antenna's mechanical tilt in degrees. Read-only.
E tilt	The antenna's electrical tilt in degrees. Read-only.
Azimuth	The antenna's beam direction in degrees. Range: 0 - 360. The initial value is fetched from the actual antenna configuration.
Diagram size (km)	Setting this distance parameter to > 0 displays a curve where the signal strength from the antenna is the same, assuming no other loss than the one specified in the antenna diagram. Initial value = 0 km indicates that no diagram is displayed. *Internally the program calculates the signal strength this distance away from the antenna. The distance is taken in the main direction of the antenna, measured from the base of the antenna as illustrated in the figure below. The angle-dependent loss is retrieved from the horizontal antenna diagram of the antenna's main lobe, and a curve showing all spots with the same signal strength is drawn.*  The use of this parameter is further explained in View Equal Signal Strength Diagram on page 7-31.
Color	Color of the tentative (thin) line and the actual (thick) line of the antenna azimuth in the map display. Initially red.

View Equal Signal Strength Diagram

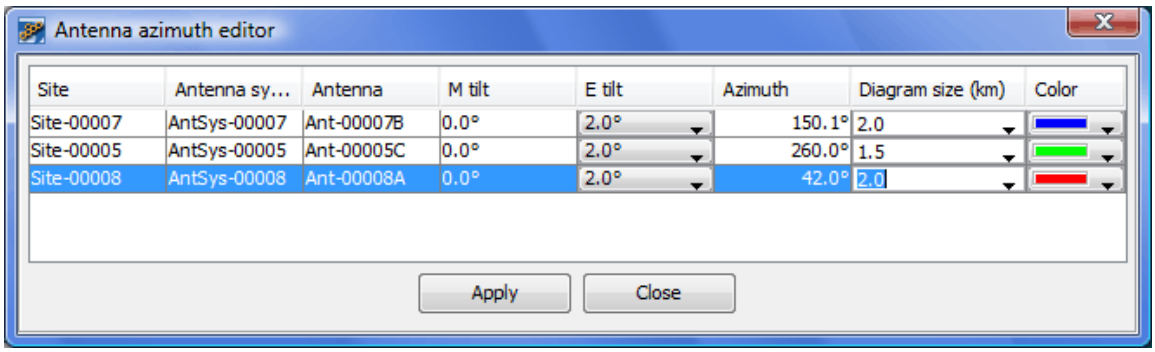
Use this procedure to display a curve of equal signal strength, assuming there is no other loss than the one specified in the antenna diagram. Note that the actual signal strength along the curve is not revealed, as the purpose of this function is to show antenna behavior, not to present numbers.

Prerequisites

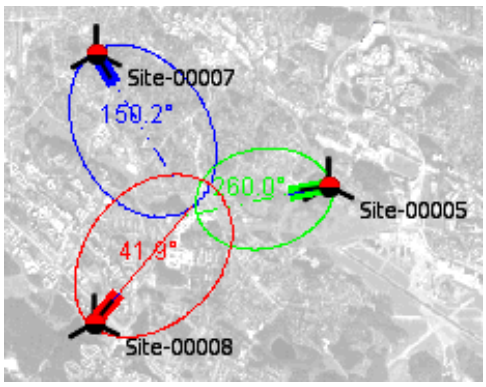
Antennas are defined, see Antenna Systems and Antenna Branches on page 7-11.

Procedure

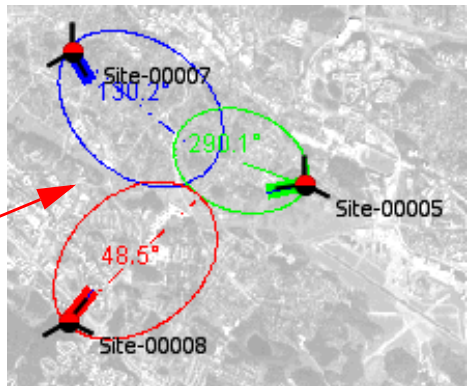
1. Select one or more antennas as described in **Edit Antenna Azimuth**.
2. Select the desired **Diagram size** in the **Antenna azimuth editor**. The diagram size is the distance between the base of the antenna and a point in the main direction of the antenna.



3. The curve ("diagram") appears in the map display. Any point along the curve has the same signal strength. When you change the azimuth, the curve follows the line as in the following example:



Moved all azimuths, biggest change in site 7:



8
Neighbors

This chapter describes how to handle neighbor relations, either manually configured or generated from analysis results.

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About Neighbors

The following types of neighbor relations are supported by TEMS CellPlanner:

[1]	GSM	WCDMA	LTE	WiMAX
GSM	X	X	X	-
WCDMA		intra and inter	X	-
LTE	X	X	intra only	-
WiMAX	-	-	-	intra only

1. intra only = intra-frequency relations only (handover between carriers of same frequency) are supported
intra and inter = intra-frequency as well as inter-frequency relations (handover between carriers of different frequencies) are supported

The neighbor relations are created as either of the following:

Generated Neighbor Lists	Neighbor relations are based on analysis results of a selected traffic case. Cells are included in the neighbor list of another cell only if handover is possible for the traffic case. These neighbor lists are just analysis results, but you can feed back the generated neighbor relations into the cell configuration by using an Apply button.
Manually Created Neighbor Relations	Neighbor relations are manually created. Neighbors are selected from a tree structure in the Site explorer or appropriate RBS explorer, or graphically from the map display. The neighbor relations are saved in the cell configuration when you Apply them.

You can export and import generated neighbor lists. You can also export and import neighbor relations in the cell configuration from the file menu (File↗Export, File↗Import). Note that the file formats of those two exports are not compatible.

Generated Neighbor Lists

The neighbor analysis invoked from **Analysis↗Neighbor list↗Generate neighbor lists** automatically creates neighbor lists for a selected traffic case.

The neighbor analysis evaluates, for each cell and selected traffic case, possible neighbor cells using the specified carrier. Neighbor cells are the cells to/from which handover is possible from/to the analyzed cell. For each analyzed cell, the analysis presents the neighbor cells in a *neighbor list*. You accept the contents of the neighbor list by applying the list.

This automatic neighbor generation is the quickest and most reliable method to setup neighbor lists. Only relations allowing handover are included in the generated neighbor lists. If you rely on the analysis to generate the neighbor lists for you, no user interaction is needed after having generated the lists.

You may override the automatic selection by moving cells between the *neighbor list* and a *waiting list* (still possible candidates), an *error list* (rejected candidates), a *blocked list* for distant or blacklisted (unallowed) cells, and a list with *all other cells*.

You can also export the generated neighbor lists from buttons in the analysis window to a text file or an Excel file with somewhat different contents. Note that you cannot use the ordinary export and import menus (File↗Export, File↗Import) to export or import generated neighbor lists, only for manually created cell neighbor lists.

Generate Neighbor Lists

Use this procedure to automatically generate lists of cells neighboring the selected cells in your network plan.

Prerequisites

- The traffic demand mix to analyze is defined, see Traffic Demands on page 5-25. You will select a traffic case from this traffic demand mix.
- The required analysis for the carrier to analyze has been successfully run. You invoke the analysis from the menu options listed below.

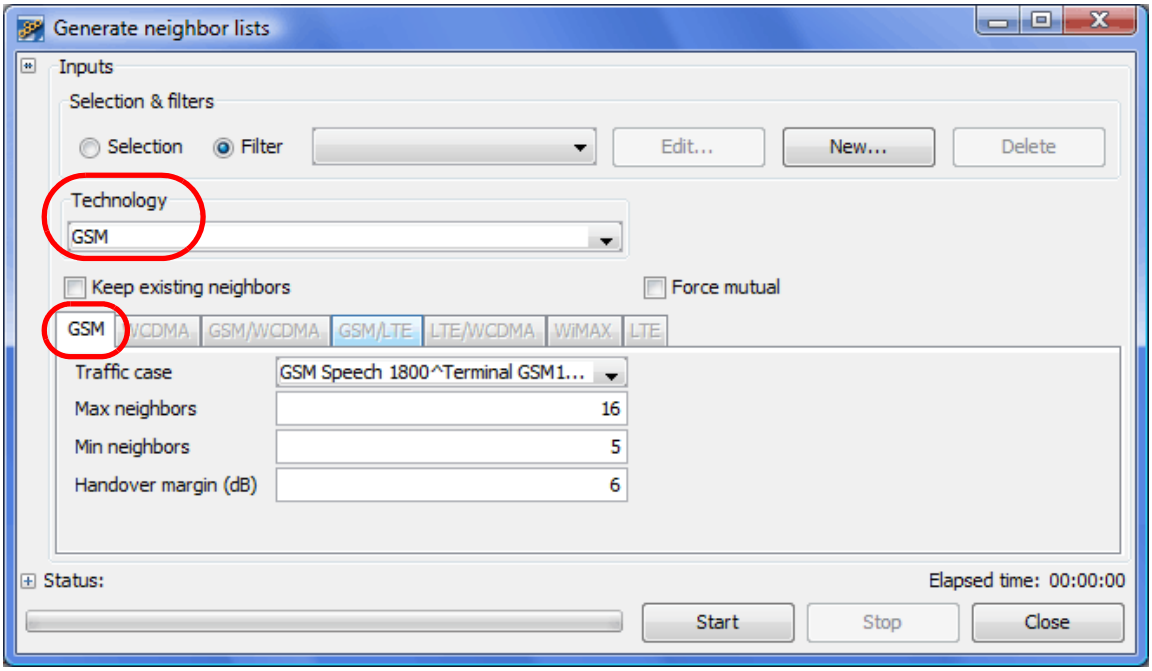
WCDMA:	**Analysis↗WCDMA↗Calculate composite pathloss** and **Analysis↗WCDMA↗Analyze WCDMA**
GSM:	**Analysis↗GSM↗Calculate best server**
LTE:	**Analysis↗LTE↗Calculate best server**
WiMAX:	**Analysis↗WiMAX↗Calculate best server**

  For more information on analysis, refer to the user's guide of the appropriate radio technology.
- For inter-technology handover you also need analysis results for the other radio technology's carrier, invoked as described above.

Procedure

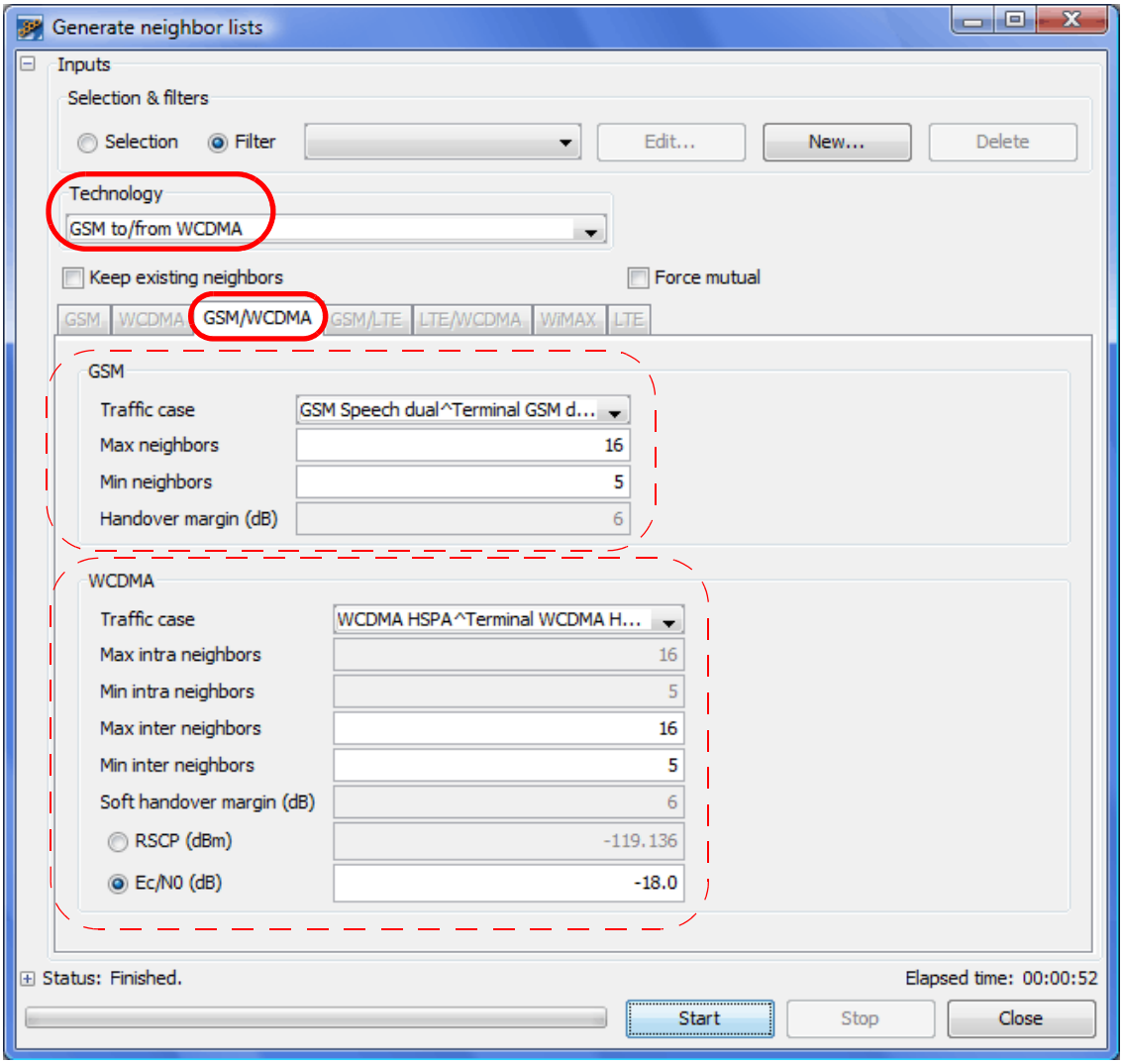
Do as follows to generate neighbor lists:

1. Select **Analysis↗Neighbor list↗Generate neighbor lists**.
   The **Generate neighbor lists** window appears as in the following example where GSM is the initially selected technology:



2. Select the type of neighbor relations to create from the **Technology** list.
   The associated tab becomes enabled, and the window shows the parameters of the selected technology. If you select to generate inter-technology

neighbors, parameters of both technologies are displayed, as in the following example for GSM to/from WCDMA:



3. Optionally limit the number of cells to analyze by a **Selection** or **Filter**.
4. To keep neighbors from previous run of Generate Neighbor Lists or from the neighbor cells in cell data, select option **Keep existing neighbors**.
5. If you want to generate neighbors for handover in any direction, select option **Force mutual**.
6. Enter parameters for the selected **Technology**, see Parameters for Generation of Neighbor Lists on page 8-6.
7. Click **Start** to generate the neighbor lists.

Proceed with Evaluate Generated Neighbor Lists on page 8-7.

Parameters for Generation of Neighbor Lists

The following parameters appear when you select a specific **Technology** in the **Generate neighbor lists** window., see Generate Neighbor Lists.

Technology	Parameter	Description
GSM	**Traffic case**	The traffic case for which to find neighbors. See Traffic Demands on page 5-25.
	Carrier name	The carrier for which to find neighbors.
	Max neighbors and **Min neighbors**	Number of allowed GSM neighbors. Range: 1 - 64. Default min = 5. Default max = 16.
	Handover margin	Required signal strength to be considered as neighbor.
LTE	**Traffic case**	The traffic case for which to find neighbors.
	Carrier name	The carrier for which to find neighbors.
	Create blocked and **Max distance**	If option **Create blocked** is enabled, neighbors located further away than the **Max distance** will be placed in the Blocked list. Minimum = 0. Default = 10 km.
	Max intra neighbors **Min intra neighbors**	Number of allowed (intra-frequency) LTE neighbors. Range: 1 - 64. Default min = 5. Default max = 16.
	Min inter neighbors **Max inter neighbors**	Not yet supported
	Handover margin	Required signal strength to be considered as neighbor.
WCDMA	**Traffic case**	The traffic case for which to find neighbors.
	Max intra neighbors and **Min intra neighbors**	Number of allowed intra-frequency WCDMA neighbors. Range: 1 - 31. Default min = 5. Default max = 16.
	Max inter neighbors and **Min inter neighbors**	Number of allowed inter-frequency WCDMA neighbors. Range: 1 - 32. Default min = 5. Default max = 16.
	Soft handover margin	Required signal strength to be considered as neighbor.
	RSCP (dBm)	Required RSCP to be considered as a neighbor.
	Ec/No (dB)	Required CPICH to be considered as a neighbor.
WiMAX	**Traffic case**	The traffic case for which to find neighbors.
	Max intra neighbors and **Min intra neighbors**	Number of allowed (intra-frequency) WiMAX neighbors. Range: 1 - 127. Default min = 5. Default max = 16.
	Handover margin	Required signal strength to be considered as neighbor.

Evaluate Generated Neighbor Lists

Use this procedure to view a summary of the generated neighbor lists.

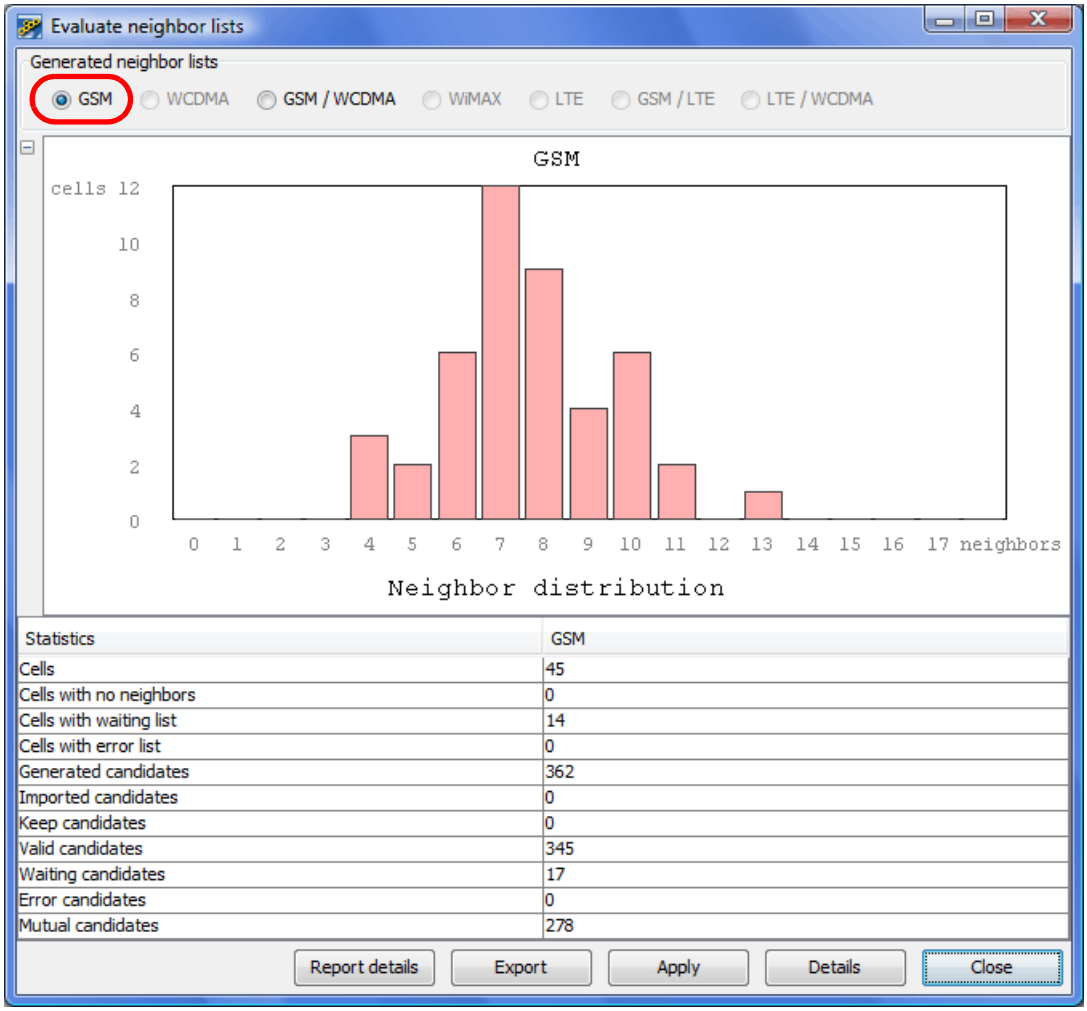
Prerequisites

Neighbors lists are generated, see Generate Neighbor Lists on page 8-3.

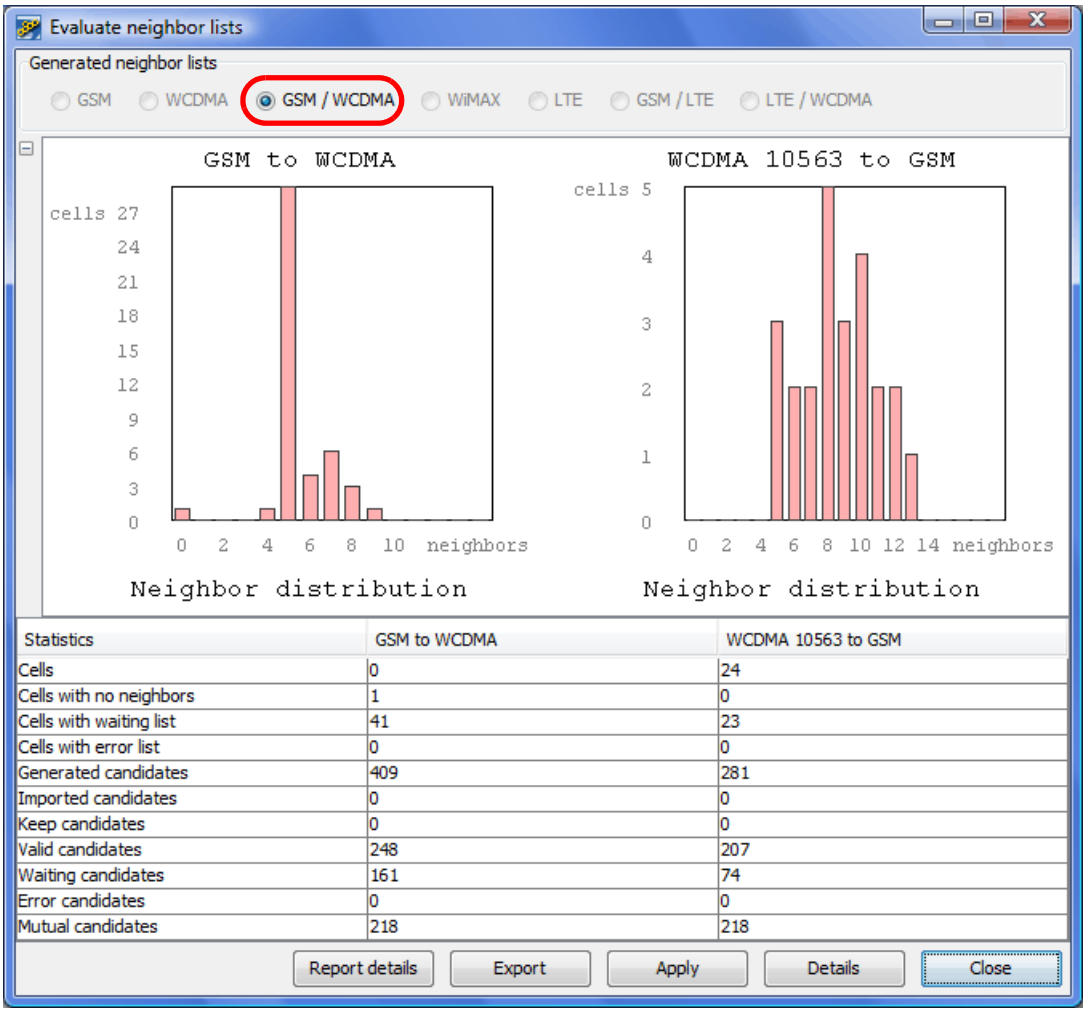
Procedure

Follow these steps to evaluate the neighbor analysis results:

1. Select **Analysis↗Neighbor list↗Evaluate neighbor lists** to open the **Evaluate neighbor lists** window. You will also be prompted to open this window directly after Generate Neighbor Lists.
2. A graph and a table with summarized statistics appear as in the examples below, showing the summary for GSM neighbors.



If you have selected "...to/from..." as **Technology** in Generate Neighbor Lists, the summary includes two graphs, as in the following example:



3. To view the generated neighbor lists in detail, click **Details** and follow the instructions in View Generated Neighbor Lists Details on page 8-9.
4. To override the automatic selection of neighbors, follow the instructions in Edit Generated Neighbor Lists on page 8-14.
5. To extract the generated neighbor lists to a text file with only cell names aimed for later import, click **Export.** This file excludes overlaps. See Export Generated Neighbor Lists to Text File on page 8-15.
6. To extract the generated neighbor lists to an Excel file including overlaps, click the **Report details** button. See Report Generated Neighbor List Details to Excel File on page 8-16.

Important: To feed back the contents of the generated neighbor lists to the cell neighbor lists in the project, click **Apply**.

Fields on Window "Evaluate neighbor lists"

Field	Description
Generated neighbor lists	Selects the radio technology for which to display generated neighbor list. Selectable if neighbor lists from multiple radio technologies are available.
Neighbor distribution chart	Histogram over neighbor distribution. The x axis displays the number of neighbors, the y axis the number of cells. In the example there are 3 cells with 2 neighbors, 8 cells with 3 neighbors, and so forth.
(neighbor statistics)	The neighbor statistics of the analyzed traffic case: • Number of cells • Number of cells with no neighbors • Number of cells with waiting list • Number of cells with error list • Total number of generated candidates • Total number of imported candidates • Total number of keep candidates • Total number of valid candidates • Total number of waiting candidates • Total number of error candidates • Total number of mutual candidates
Report details	Exports neighbor lists to an Excel file including overlaps.
Export	Exports neighbor lists to a text file.
Apply	Applies the neighbor relations to the cell data.
Details	Shows details of the neighbor relations, see Edit Generated Neighbor Lists on page 8-14.

View Generated Neighbor Lists Details

Use this procedure to view the generated neighbor lists of all analyzed cells. The **Neighbor list details** window displays a list of all analyzed cells and the neighbors found for each analyzed cell, together with the overlap percentage and status of the neighbor relation.

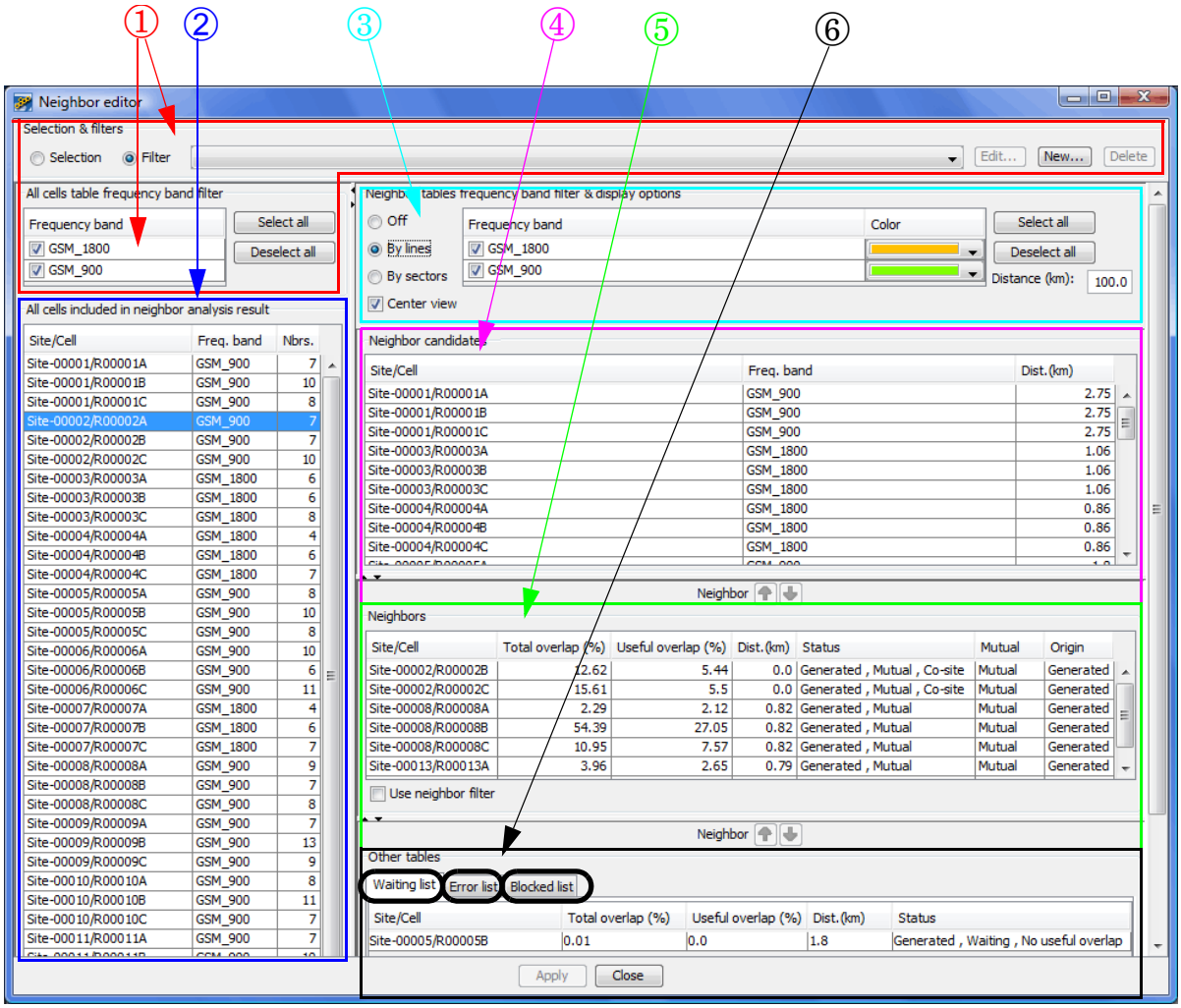
Prerequisites

Generated neighbor lists are loaded, see Generate Neighbor Lists on page 8-3.

Procedure

Follow these steps to view the neighbor analysis results:

1. Select **Analysis↗Neighbor list↗Evaluate neighbor lists**, see Evaluate Generated Neighbor Lists on page 8-7.
2. Click **Details**. The **Neighbor editor** window appears as in the following example, showing GSM to/from WCDMA neighbors with GSM cells of two frequency bands:



3. Analyze the lists, see Fields on Window "Neighbor Editor" on page 8-11.
4. To manually override the automatically generated neighbor lists, follow the instructions in Edit Generated Neighbor Lists on page 8-14.
5. To discard the edits, click **Close**. No changes in neighbor lists are saved.
6. To keep the lists as they appear, with or without manual modifications, click **Apply**. The lists are saved in the calculation results directory and are retrieved

the next time you Generate Neighbor Lists. You can then select to **Keep existing neighbors** to not overwrite manual changes.

Important: If you wish to feed back the changes to the cell neighbor lists in the project, you must click **Apply** in the **Evaluate neighbor lists** window.

Fields on Window "Neighbor Editor"

As this window includes a large amount of information, each part of the window is separately described. The table below reflects the layout of the window. Follow the links to the appropriate description.

<table>
<tr><td rowspan="2">①</td><td rowspan="2">① Filters of analyzed cells</td><td>③ Neighbor tables frequency band filter & display options ③</td></tr>
<tr><td rowspan="4">② All cells
The title of this list is "All cells included in the neighbor analysis results" when invoked from Analysis↗Neighbor list, but "All cells" when invoked from Analysis↗Neighbor editor.</td></tr>
<tr><td>④ Neighbor candidates ④</td></tr>
<tr><td>⑤ Neighbors ⑤</td></tr>
<tr><td>⑥ Other tables (Waiting list, Error list, Blocked list)
This field is present when invoked from Analysis↗Neighbor list, but is missing when invoked from Analysis↗Neighbor editor. ⑥</td></tr>
<tr><td colspan="2">Apply</td><td>Save the edits</td></tr>
<tr><td colspan="2">Close</td><td>Discard the edits</td></tr>
</table>

① Filters of analyzed cells

Selection and filters	Only the cells passing this filter selected from predefined Filters, or selection from map, will be included in ② All cells.
All cells table frequency band filter	Only the cells of the selected frequency band(s) will be included in ② All cells.

② All cells

This list is displayed on the left side of the window, and includes all cells passing the filters above. One cell at a time can be selected from this list, and its neighbors (and neighbor candidates) are shown in the right side of the window. Each row displays **Site/Cell**, **Frequency band** and number of **Neighbors** of the cell.

③ Neighbor tables frequency band filter & display options

Some of these parameters filter the contents of the lists ④ Neighbor candidates and ⑤ Neighbors, other how neighbor relations are displayed graphically, see Display Neighbor Relations on page 8-20.

display options • Off • By lines • By sectors	Options ruling how neighbor relations are displayed in the map display. One option is always selected.
Frequency band	Filter for the lists ④ Neighbor candidates and ⑤ Neighbors. The **Color** rules the coloring of the relation in the map display.
Distance	More cells can be added to the ④ Neighbor candidates list by decreasing the allowed distance. Note that cells are not automatically moved from the ④ Neighbor candidates list to the ⑤ Neighbors if the distance is increased.
Center view	Option to center the map display around the selected cell in ② All cells.

④ Neighbor candidates

A list of neighbor candidates, that is, cells not yet included in any of the other lists **Neighbors**, **Waiting list**, **Error list**, or **Blocked list**.

Site/Cell	Site and cell id of the non-neighbor cell.
Freq. band	Frequency band of the non-neighbor cell.
Dist. (km)	Distance from analyzed cell.
↓	Moves the selected cell to the ⑤ Neighbors list below.

⑤ Neighbors

Actual neighbor cells. This list initially includes the neighbor cells found to allow handover when you Generate Neighbor Lists, or placed here manually when you add Manually Created Neighbor Relations.

You may manually place any cell on the neighbor list, even cells that were not found to be neighbor candidates in the Generated Neighbor Lists.

Each cell in the list is described by among other the following parameters:

Site/Cell	Site and cell id of the neighbor.
Total overlap (%)	Overlap of cell neighbor area using the predicted signal strength. The area is expressed as a percentage of the neighbor cell's best server area.
Useful overlap (%)	The area where the neighbor cell's signal strength is within the handover margin, that is, where a handover is likely to take place. The area is expressed as a percentage of the neighbor cell's best server area.
Dist. (km)	Distance from analyzed cell.

Status	Additional information about the neighbor relation. Multiple values are comma separated. Possible values: • Co-site - Automatically generated relation, neighbor cell located in same RBS as the analyzed cell • Generated - Automatically generated relation. Automatically placed in the Neighbors list is the overlap is useful. • No useful overlap - Automatically generated relation, but without useful overlap. None of the cells are within the handover margin. Candidates with no overlap within the handover margin are placed on the waiting list when the target cell's neighbor list has the minimum number of required neighbor relations. • Added by user - Relation manually added by the user after generating the neighbor list • Imported - Imported from **Import to neighbor list**
Mutual	Possible values: • Mutual - Handover can be done in any direction. • Non-mutual relation - The neighbor cell has no neighbor relation to the analyzed cell. Handovers can only be done from the analyzed cell to the neighbor cell.
Origin	The reason for the relation being in this list. Possible values: • Generated - The relation is automatically generated • Added by user - Relation manually added by the user after generating the neighbor list
↑	Moves the selected cell to the list of ④ Neighbor candidates above.
↓	Moves the selected cell to the currently displayed list below in the ⑥ Other tables (Waiting list, Error list, Blocked list).

⑥ Other tables (Waiting list, Error list, Blocked list)

Waiting list	"Observation" list of candidate neighbor cells. This list initially includes candidate neighbors found when you Generate Neighbor Lists. You may manually place any cell on the waiting list, even cells that were not found to be possible neighbors when generating neighbor lists. Each cell in the list is described by the same parameters as in the ⑤ Neighbors list, plus additional status values applicable only for the waiting list: **Status** • Waiting - All cells in the waiting list has this status. • Exceeded list length - Candidates on the waiting list are there because the list of qualified neighbors reached the allowed maximum.
Error list	Cells rejected as neighbor cells. This list initially includes possible neighbors found when the neighbor list is already full. You may manually place any cell on the error list. Each cell in the list is described by the same parameters as in the ⑤ Neighbors list, plus additional status values applicable only for the waiting list:

	Status	• Error - All cells in the error list has this status. • Deleted by user - Neighbor relation manually removed from the neighbor list. • Wanted by reverse neighbor - The target cell's neighbor list has reached its maximum number of neighbor relations; the option "Force mutual" has no effect.
Blocked list	Cells not allowed as neighbors due to being on the blacklist or being too distant. This list initially includes cells being too far away according to the distance entered when you Generate Neighbor Lists. You may manually place any cell, for example blacklisted LTE cells, on the blocked list. Each cell in the list is described by the same parameters as in the ⑤ Neighbors list.	
↑	Moves the selected cell in the currently displayed list to the ⑤ Neighbors list above.	

Edit Generated Neighbor Lists

Use this procedure to override automatically generated neighbor lists.

Prerequisites

Neighbor lists are currently viewed, see View Generated Neighbor Lists Details on page 8-9.

Procedure

- To add a cell to the neighbor list, highlight the cell in another list (**All cells**, **Waiting list**, **Error list**, or **Blocked list**) and use the ↑ or ↓ arrows to move the cell to the **Neighbors** list.

  Note: *Handover might not be possible between the analyzed cell and the added neighbor cell, as there is no check of the handover margin when moving relations manually.*

- To remove a cell from the neighbor list, highlight the cell in the **Neighbors** list and use the ↑ or ↓arrows to move the cell to any of the other lists: **All cells**, **Waiting list**, **Error list**, or **Blocked list**.
- To discard manual changes made before saving the changes, click **Close**.
- To commit the modifications, click **Apply**. The modified lists are saved in the calculations results directory.

Blacklist LTE Cells in Generated Neighbor Lists

You can blacklist LTE cells from being neighbors by moving cells from any list to the **Blocked list**, see Edit Generated Neighbor Lists on page 8-14.

In the same way you can allow a blacklisted cell to become a neighbor by moving it from the **Blocked list** to any of the other lists.

Export Generated Neighbor Lists to Text File

You can export generated neighbor lists to a text file as described below. Only the neighbors are reported, not the waiting list, error list, or blocked list.

1. Evaluate Generated Neighbor Lists.
2. Click **Export** to extract the neighbor lists to a tab separated text file. The contents of the **Neighbor list** is exported. Note that the **Blocked list** is not exported, hence the text file includes no information about blacklisted LTE cells.

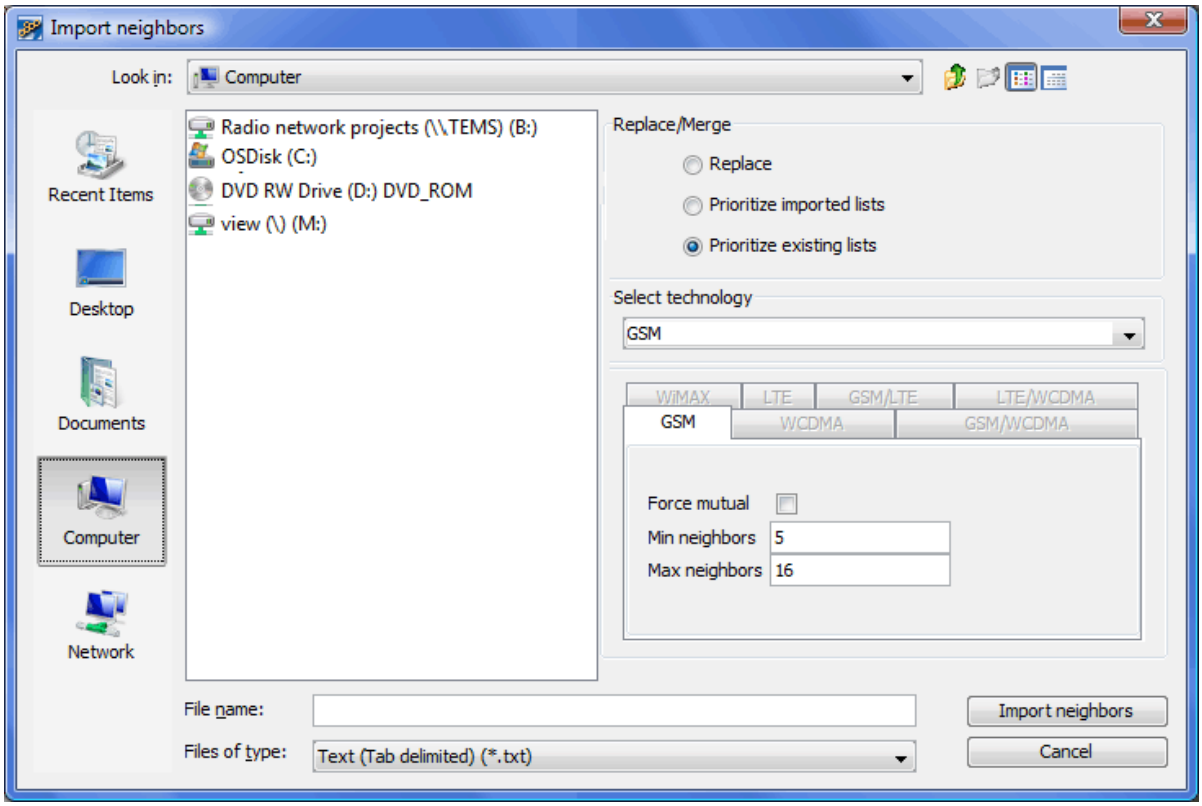
See also Import Neighbors from Text File to Generated Neighbor List.

Import Neighbors from Text File to Generated Neighbor List

The format of the expected file the same as the one created in Export Generated Neighbor Lists to Text File. It is a tab separated text file with one row per cell, with the source cell to the left and all its neighbors listed on the row.

Do as follows to import a neighbor list file of this format and display it as a generated neighbor list.

1. Select **Analysis↗Neighbor list↗Import to neighbor list**. The import window appears as in the following example:



2. Select the **Technology** for which to import neighbor relations.
3. Select the file to import.
4. Select other parameters as desired.
5. Click **Import neighbors**.
6. Check the result and possibly save and apply the imported neighbors.
See Evaluate Generated Neighbor Lists on page 8-7

Important: If you wish to feed back the changes to the cell neighbor lists in the project, you must click **Apply** in the **Evaluate neighbor lists** window.

Report Generated Neighbor List Details to Excel File

You can create a report including details from generated neighbor lists. The report contains four Excel sheets: **Neighbor list**, **Waiting list**, **Error list**, and **Blocked list**. Information about total and useful overlap is included.

Do as follows to create the report:

1. Evaluate Generated Neighbor Lists.
2. Click **Report details**.
3. Enter the file name of the report and select **Report neighbors**.
4. A detailed neighbor report in Excel format is created. See example below.

Example: Report of Generated Neighbor List Details

	A	B	C	D	E	F	G	H	I
1	TEMS™								
2									
3									
4	*Neighbor*								
5									
6	*Type*	*Neighbor*							
7	*Version*	*2*							
8	*TCP version*	*9.1.0.70 (Info model: 84)*							
9	*Technology*	*LTE*							
10	*Date*	*Mar 14, 2010 10:59:52 PM*							
11	*Comment*	*LTE*							
12									
13	***Cell***	***Neighbor***	***Total overlap (%)***	***Useful overlap (%)***	***Status***	***Mutual***	***Origin***	***GsmCell.userLabel/LteRelation.userLabel***	
14	RBS-00004C1	RBS-00004B1	25.77	4.11	Generated , Mutual , Co-site	Mutual	Generated	RBS-00004C1/RBS-00004B1	
15	RBS-00004C1	RBS-00004A1	18.46	2.61	Generated , Mutual , Co-site	Mutual	Generated	RBS-00004C1/RBS-00004A1	
16	RBS-00004C1	RBS-00007B1	15.1	5.81	Generated , Mutual	Mutual	Generated	RBS-00004C1/RBS-00007B1	
17	RBS-00004C1	RBS-00006B1	3.81	3.78	Generated , Mutual	Mutual	Generated	RBS-00004C1/RBS-00006B1	
18	RBS-00004C1	RBS-00005A1	3.57	3.29	Generated , Mutual	Mutual	Generated	RBS-00004C1/RBS-00005A1	
19	RBS-00004C1	RBS-00007A1	13.0	2.91	Generated , Mutual	Mutual	Generated	RBS-00004C1/RBS-00007A1	
20	RBS-00004C1	RBS-00006C1	0.05	0.05	Generated , Mutual	Mutual	Generated	RBS-00004C1/RBS-00006C1	
21	RBS-00004B1	RBS-00004C1	32.13	4.12	Generated , Mutual , Co-site	Mutual	Generated	RBS-00004B1/RBS-00004C1	
22	RBS-00004B1	RBS-00004A1	20.51	1.99	Generated , Mutual , Co-site	Mutual	Generated	RBS-00004B1/RBS-00004A1	
23	RBS-00004B1	RBS-00001C1	14.84	11.68	Generated , Mutual	Mutual	Generated	RBS-00004B1/RBS-00001C1	
24	RBS-00004B1	RBS-00002A1	17.91	6.48	Generated , Mutual	Mutual	Generated	RBS-00004B1/RBS-00002A1	

Troubleshooting Generated Neighbor Lists

Sometimes a cell only gets neighbors in the same site according to the results from Generate Neighbor Lists. The explanation is that the cell has no best server area, since it is completely overlapped by other, stronger cells.

You can solve this problem in different ways:

- If the cell appears as a non-mutual neighbor to surrounding cells, select the **Force mutual** box in the **Generate neighbor lists** window, or use the **Make mutual** button for the surrounding cells in the **RBS explorer**.
- Enhance the coverage of the cell by increasing its power.
- Use a higher resolution in the pathloss prediction to obtain a more visible coverage of the cell.

Manually Created Neighbor Relations

You can perform the following manual actions on neighbor relations:

- Select Source Cell
- Display Neighbor Relations
- Filter Neighbor Relations
- Add Neighbor Relations in Explorer
- Add Neighbor Relations in Map Display
- Add Neighbor Relations in Neighbor Editor
- Delete or Modify Neighbor Relations in Explorer
- Remove or Modify Neighbor Relations in Map Display
- Remove or Modify Neighbor Relations in Neighbor Editor

Note that manually added neighbor relations are not evaluated from a handover perspective. To ensure that relations can be used for handover you should instead use the **Analysis** menu to Generate Neighbor Lists where handover margins are considered.

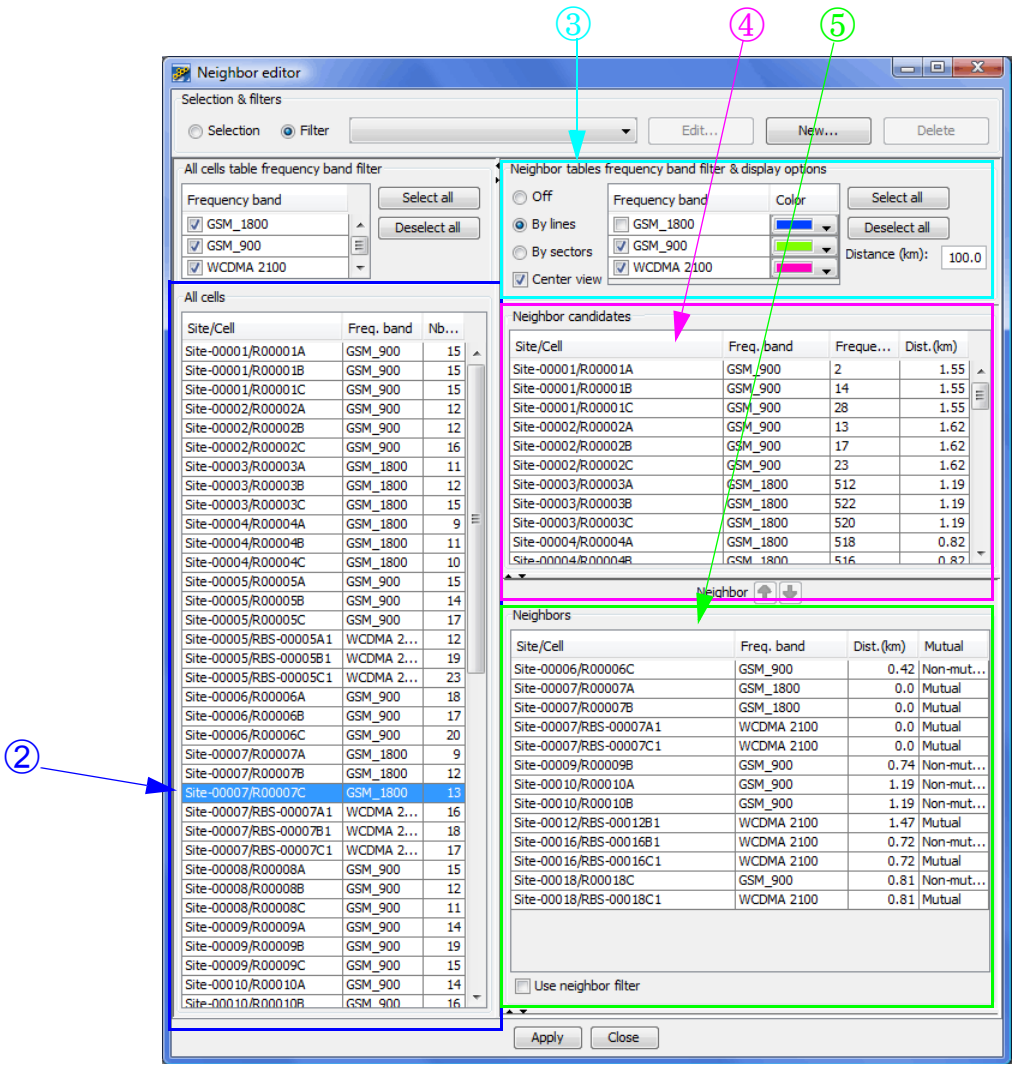
The term *source cell* in this chapter means the cell for which to display, add, delete, or modify neighbor relations, while target *cell* means the other cell of the relation.

Select Source Cell

For some operations you shall start by selecting the source cell. You can either select the cell from a list of cells in the Neighbor editor (alternative A), or graphically from the map display (alternative B). In both cases you must have the **Neighbor editor** window open.

A. Do as follows to select a source cell from a list of cells:

1. Select **Analysis↗Neighbor editor**.
2. Select the source cell by left-click in the list of **All cells** (same contents as ② All cells). The right part of the **Neighbor editor** window shows the ④ Neighbor candidates and already selected ⑤ Neighbors of the cell, as in the GSM / WCDMA example below:



See Fields on Window "Neighbor Editor" on page 8-11.

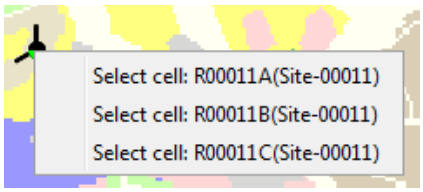
B. Do as follows to select a source cell directly from the map display:

1. Click the neighbor cursor icon in the left toolbar of the map display, or select **Analysis↗Neighbor editor** from the menu. The **Neighbor editor** is opened and the map display enters neighbor edit mode.

   You can hide the Neighbor editor window by minimizing it, but you must have it open to remain in neighbor edit mode.

2. Select the source cell by left-clicking on its antenna symbol.

   As an alternative you can left-click on the site symbol and select the source cell from a list of cells in the site, as in the following example:



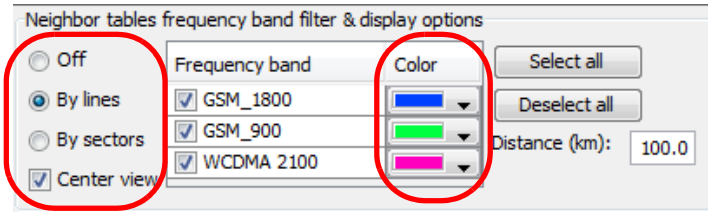
   The selected antenna symbol becomes colored and the source cell's existing neighbor relations are displayed, see Display Neighbor Relations.

Display Neighbor Relations

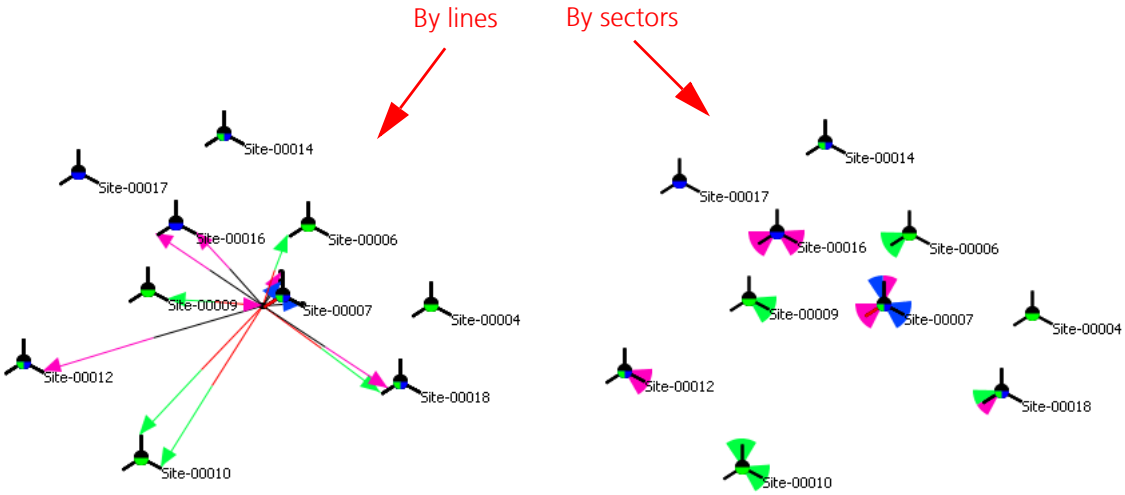
You can show the neighbor cells of a selected cell on the map display, either by color marking the neighbor cells, or by drawing lines to the neighbor cells.

Do as follows to view neighbor cells on the map display:

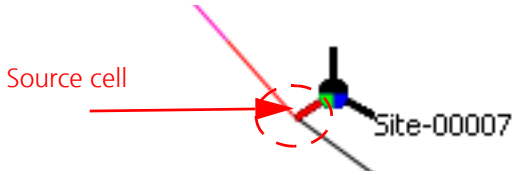
1. Select Source Cell from the map display or from a list of cells.
2. The map display shows the cell's relations according to the surrounded options in the ③ Neighbor tables frequency band filter & display options below:



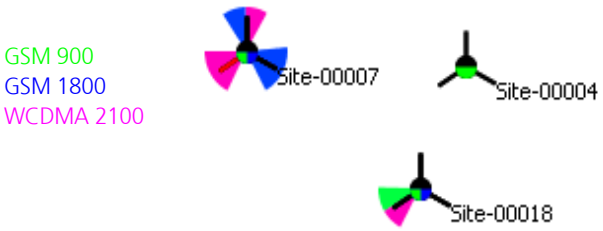
3. If desired, change the display options, including the **Color** to use per frequency band. In the following example, the same relations are shown **By lines** to the left, and **By sectors** to the right:



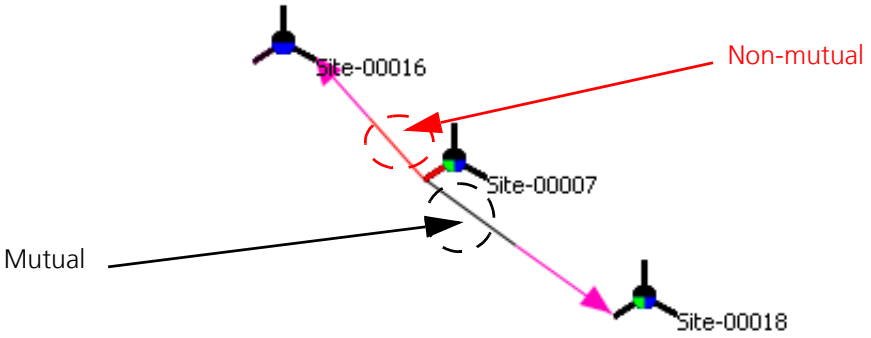
The selected source cell's antenna symbol becomes red-colored:



Neighbor relations of co-sited cells are visualized in two colors; one color per frequency band, either as two lines of different color (display mode = By lines), or as two half-sectors (display mode = By sectors). The latter example is visualized in the following figure:



To see if a relation is mutual or non-mutual, use the **By lines** option and observe the first part of the arrow. Mutual relations are visualized in black, and non-mutual relations in red color:



4. Optionally Filter Neighbor Relations to reduce the number of displayed relations.

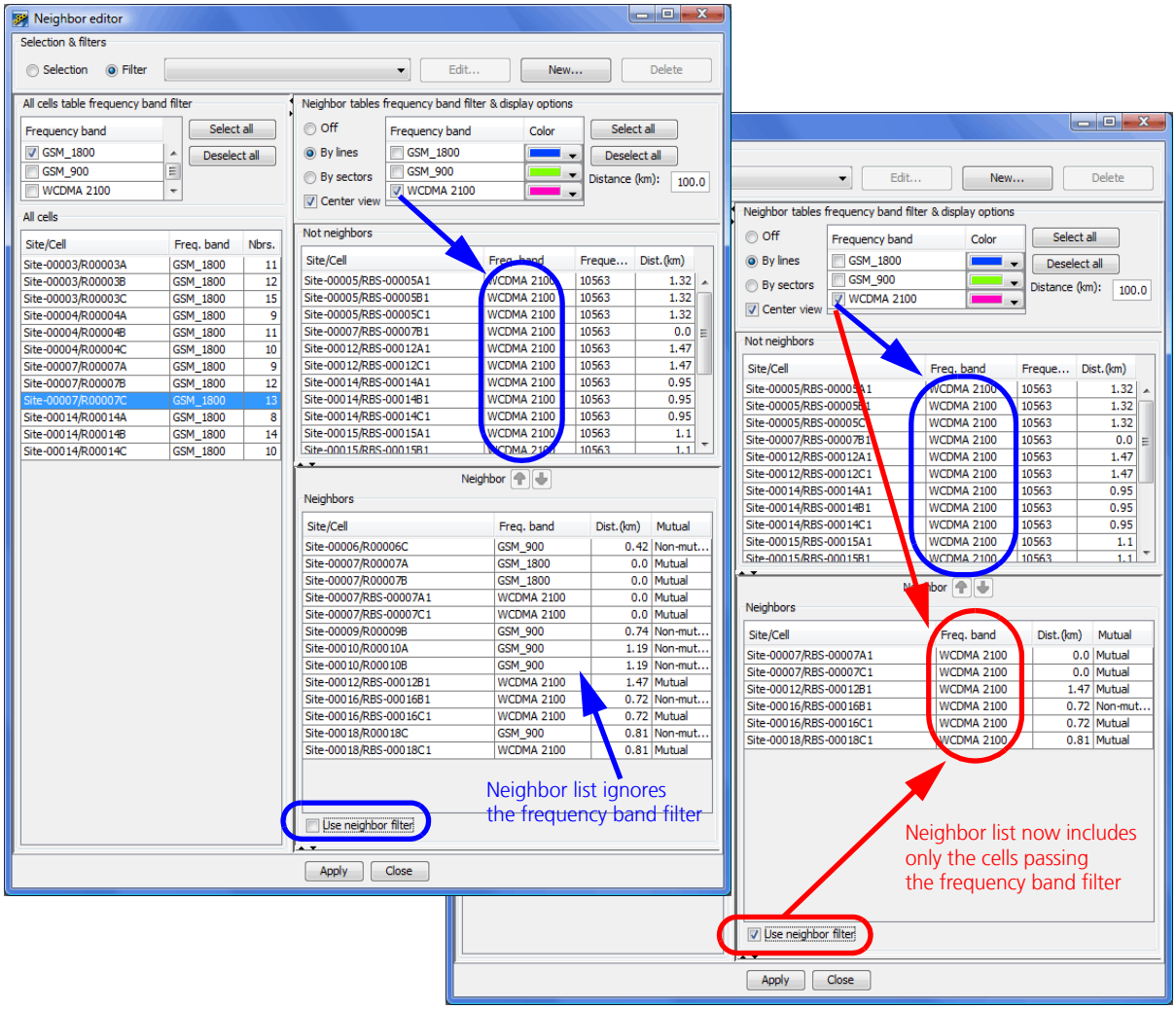
Filter Neighbor Relations

The frequency band filter in ③ Neighbor tables frequency band filter & display options normally applies only to the cells in the list of ④ Neighbor candidates, but not to the ⑤ Neighbors list, and thus not to the map display.

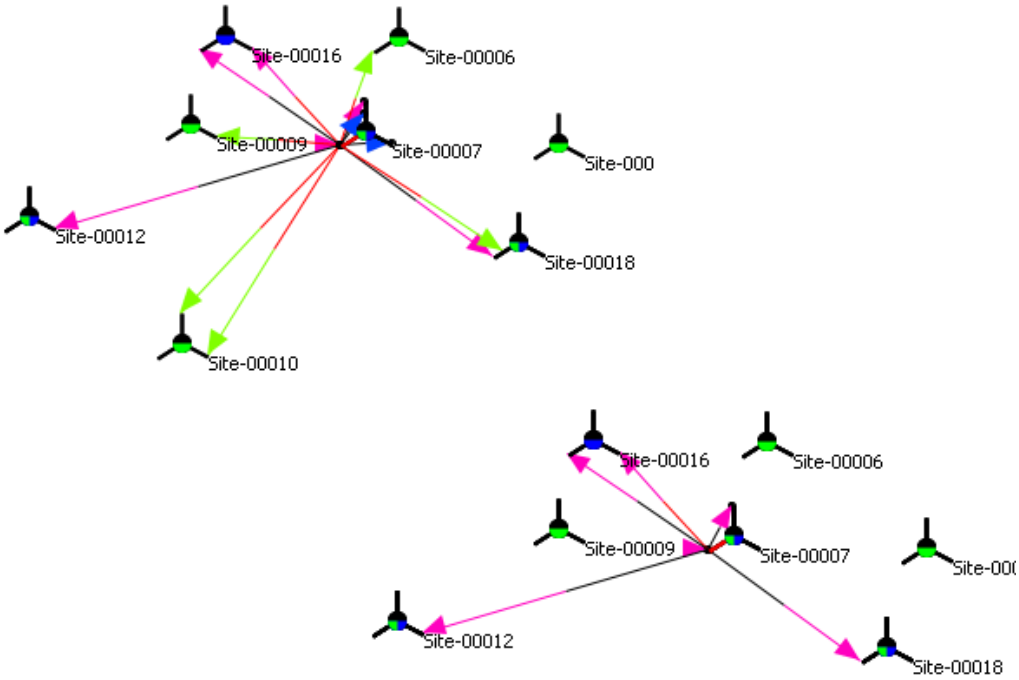
The reason for this default of not filtering existing neighbors is that you typically want to add neighbors of a certain frequency band, but still see all neighbors.

If you want to filter also the ⑤ Neighbors list and the neighbors in the map display, you must select option **Use neighbor filter** under the neighbors list, as in this example where the WCDMA 2100 filter is selected for neighbor tables and display.

In the neighbor editor to the left the **Use neighbor filter** is cleared. Only the WCDMA 2100 cells in the Neighbor candidates list pass the frequency band filter, but the Neighbor list ignores the filter. To the right, the **Use neighbor filter** is enabled, forcing the Neighbor list to show only neighbors passing the filter:



The same filtering rules are valid also for the neighbors shown in the map display. In the left-most example, the **Use neighbor filter** is cleared, hence all neighbors are displayed. To the right, the **Use neighbor filter** is enabled, and now only the WCDMA 2100 neighbors are displayed:



Add Neighbor Relations in Explorer

Use the Site explorer or the appropriate RBS explorer to add or delete neighbor relations manually, or to make existing one-way relations mutual.

Prerequisites

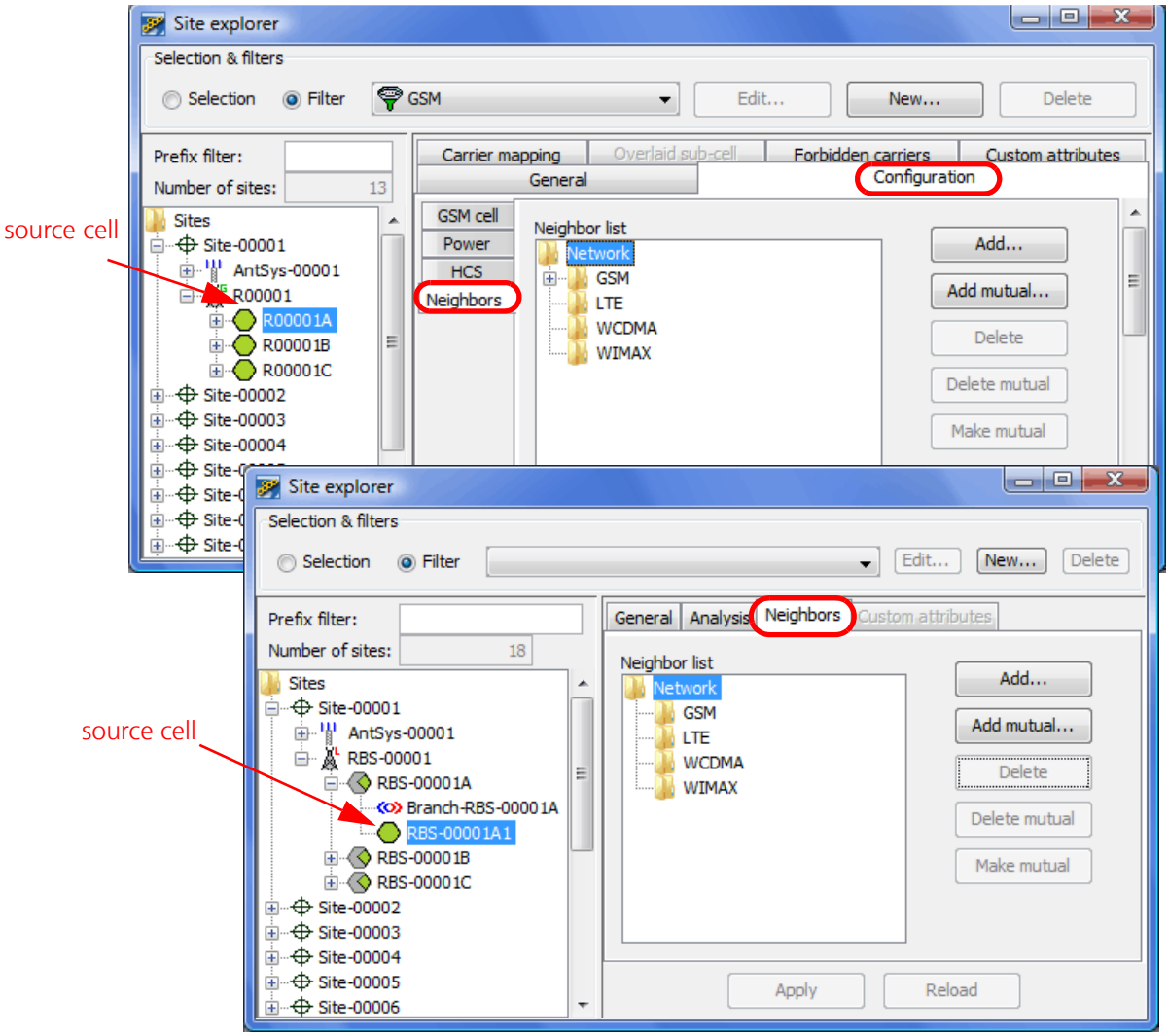
- The source cell, to which neighbors shall be added, is defined.
- The cells to add as neighbors are defined.

Procedure

Do as follows to manually add neighbors from an explorer:

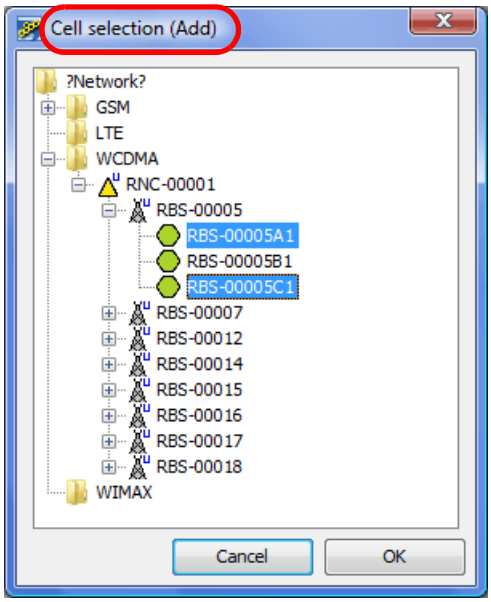
1. Open the **Site explorer** or the appropriate **RBS explorer** and select the source cell, as in the examples below.

2. Select the appropriate Neighbors tab: LTE and WiMAX neighbors are selected directly from tab **Neighbors**. GSM and WCDMA neighbors are selected from tab **Configuration**, sub-tab **Neighbors**:

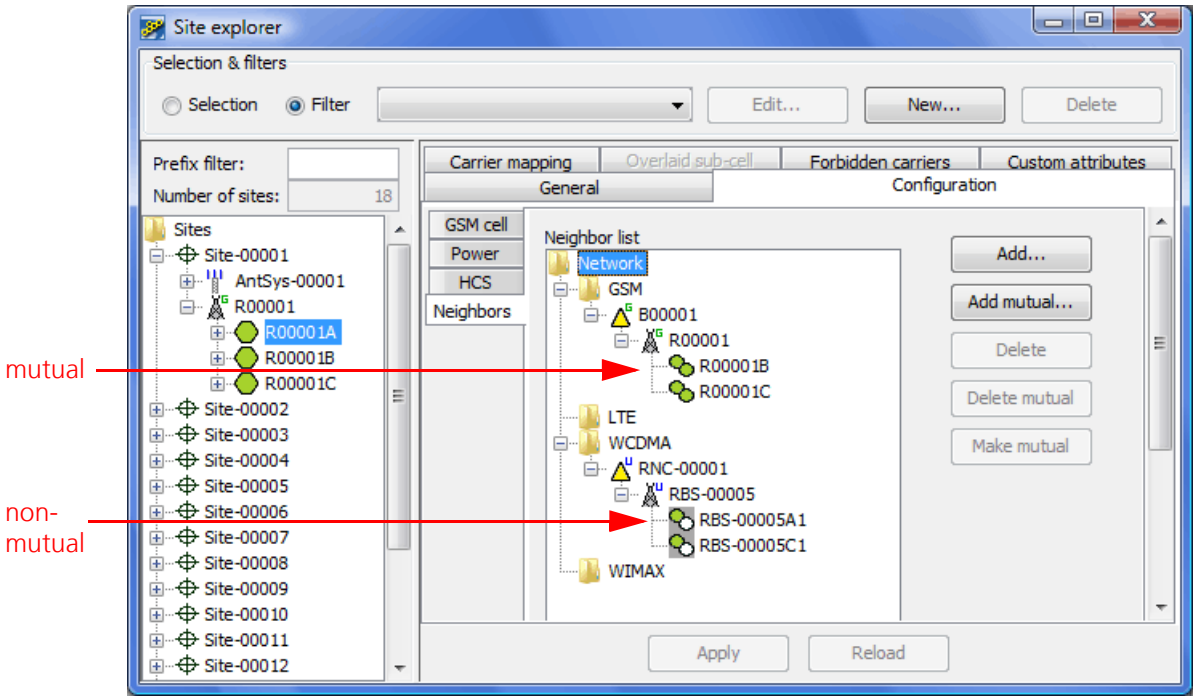


3. Add neighbor relations by clicking **Add** or **Add mutual**. In the non-mutual case, the **Cell selection (Add)** window with possible neighbors appears. In the mutual case, the **Cell selection (Add mutual)** window with possible neighbors appears.

4. Expand the tree of the radio technology of desired target cells (GSM, LTE, WCDMA or WiMAX), select the cell(s) to add as neighbors, and click **OK**, as in the example below where WCDMA cells 5A1 and 5C1 are selected:



5. The neighbor list in the explorer is updated with the new relations. In the example below, the resulting neighbors are two mutual GSM-GSM relations (with GSM 1B and 1C) and two one-way GSM-WCDMA relations (with WCDMA 5A1 and 5C1):



Fields on Window "Neighbor list"

Neighbor list	Shows the neighbors for a cell, organized by technology and then by RBS. The list indicates when the relation is mutual, meaning that the source cell is also included on the neighbor list of the target cell.
Neighbor relation symbols	
mutual	Mutual neighbor relations are displayed as double green cell icons. A relation is mutual if the source cell has the target cell as neighbor and the target cell has the source cell as neighbor. A mutual relation is actually a paired relation, or two single relations; one in each direction. Making a mutual relation non-mutual is deleting one of the two single relations
non-mutual	Non-mutual neighbor relations are displayed as green/white cell icons. A relation is non-mutual if only the source cell has the target cell as neighbor, but not the other way around.
Add...	Displays the **Cell selection (Add)** window for adding neighbor cells to the source cell. Makes the relation non-mutual.
Add mutual...	Displays the **Cell selection (Add mutual)** window for adding neighbor cells to the source cell. Each mutual relation added to the source cell is made mutual.
Delete	Deletes neighbor relations from a cell.
Delete mutual	Deletes neighbor relations from source and target cell(s).
Make mutual	The source cell is added as neighbor in the target cell(s).
(Not displayed in the examples above, but appears at bottom of full-size window):	
Name	Name of the source cell.
Blacklisted as neighbor	LTE specific option, indicating that the cell is unallowed as neighbor.

Add Neighbor Relations in Map Display

You can add neighbors directly in the map display, when you have first opened the **Neighbor editor**. Adding neighbors graphically is a two-step action: First you select the source cell, then the target cell(s).

Prerequisites

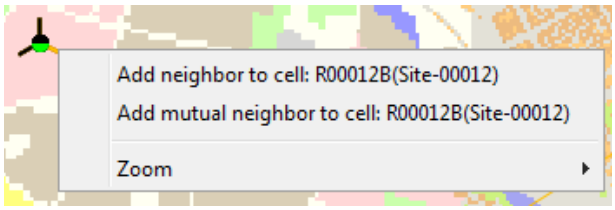
- The source cell, to which neighbors shall be added, is defined.
- The cells to add as neighbors are defined.
- The network layer is displayed, see Hide and Show Layers on page 9-13.

Procedure

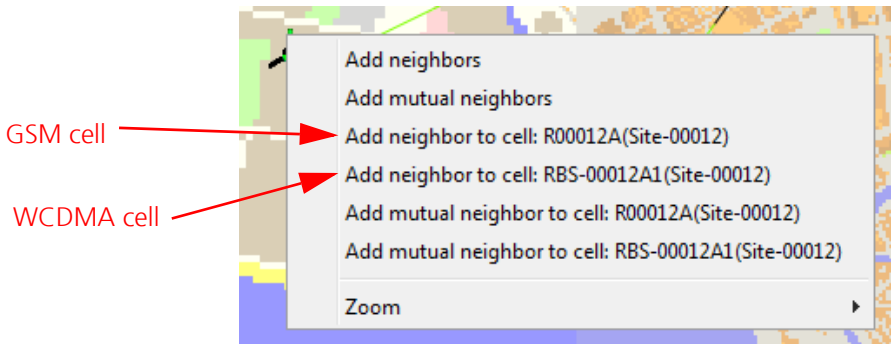
Do as follows to add neighbors from the map display:

1. Select Source Cell to which you shall add neighbor relations.

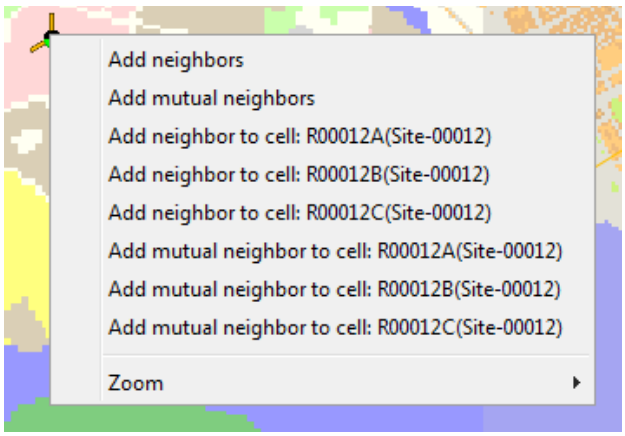
2. To add a neighbor relation to a single cell, right-click on its antenna symbol, colored according to the display options. If the cell is a neighbor candidate to the source cell, the list includes **Add neighbor to cell ...** or **Add mutual neighbor to cell ...** Select to add a mutual or non-mutual relation:



If the selected antenna serves co-sited RBSs of different radio technologies, you must select for which RBS to add neighbors, as in the GSM/WCDMA example below, You can choose to add relations to all listed neighbor candidates by selecting **Add neighbors** or **Add mutual neighbors**:



If you right-click on a site symbol, the list shows all neighbor candidates in that site, as in the example below. Select a single relation from the list, or **Add neighbors** or **Add mutual neighbors** to create relations to all listed cells.


Add neighbors
Add mutual neighbors
Add neighbor to cell: R00012A(Site-00012)
Add neighbor to cell: R00012B(Site-00012)
Add neighbor to cell: R00012C(Site-00012)
Add mutual neighbor to cell: R00012A(Site-00012)
Add mutual neighbor to cell: R00012B(Site-00012)
Add mutual neighbor to cell: R00012C(Site-00012)
Zoom

Added relations are displayed according to the display options, see ③ Neighbor tables frequency band filter & display options. The new neighbors are moved from the Neighbor candidates list to the Neighbors list in the Neighbor editor.

3. Click **Apply** in the Neighbor editor to preserve the changes in the project.

Add Neighbor Relations in Neighbor Editor

You can add neighbors from a list of neighbor candidates to the neighbors list in the **Neighbor editor**.

Prerequisites

- The source cell, to which neighbors shall be added, is defined.
- The cells to add as neighbors are defined.

Procedure

Do as follows to manually add neighbors from the neighbor editor:

1. Select **Analysis↗Neighbor editor** to open the **Neighbor editor** window.
2. Select a source cell by left-click from the list ② All cells.
3. Select one or more ④ Neighbor candidates and use the down-arrow to move them to the list of ⑤ Neighbors.
4. Click **Apply** to preserve the new neighbor settings in the project.

Delete or Modify Neighbor Relations in Explorer

You can make non-mutual neighbor relations mutual or the other way around, and delete relations completely, in the **Site explorer** or the appropriate **RBS explorer**.

Prerequisites

The neighbor relations to delete or modify are defined in the project.

Procedure

Do as follows to modify or remove neighbor relations from an explorer:

1. Open the **Site explorer** or the appropriate **RBS explorer** and locate existing neighbor relations, see Add Neighbor Relations in Explorer.
2. To make non-mutual relations mutual:
   - Select the relations to modify. Non-mutual relations are displayed as .
   - Click **Make mutual**. The source cell is added to the neighbor list of the target cell, and the relation symbol is changed to .
3. To make mutual relations non-mutual:
   - Select the relations to modify. Mutual relations are displayed as .

- Click **Delete**. The target cell is deleted from the neighbor list of the source cell, and the relation symbol is changed to . The relation in the opposite direction is retained, that is, handover to the source cell is still possible.

4. To delete mutual relations completely:
   - Select the relations to delete. Mutual relations are displayed as .
   - Click **Delete mutual**. The target cell is deleted from the neighbor list of the source cell, and the source cell is deleted from the neighbor list of the target cell. The relation symbol disappears from the explorer.

Remove or Modify Neighbor Relations in Map Display

You can remove or modify neighbor relations directly in the map display, when you have first opened the **Neighbor editor**.

Prerequisites

- The neighbor relations to modify or remove are defined in the project.
- The network layer is displayed, see Hide and Show Layers on page 9-13.

Procedure

Do as follows to remove or modify neighbors from the map display:

1. Select Source Cell from which you shall remove or modify neighbor relations.
2. Select one or more neighbor relations by **CTRL+left-click** on the relation line(s).
3. Right-click to select the appropriate action, which is either of the following:
   - **Remove neighbors** (all relations)
   - **Remove mutual neighbors** (all relations)
   - **Make neighbors non-mutual** (all relations)
   - **Remove neighbor to cell ...** (one relation)
   - **Remove mutual neighbor to cell ...** (one relation)
   - **Make neighbor non-mutual...** (one relation)
   - **Make neighbor mutual...** (one relation)
4. Click **Apply** in the Neighbor editor to preserve the changes in the project.

   The exact consequences of those actions are the same as in Remove or Modify Neighbor Relations in Neighbor Editor.

Remove or Modify Neighbor Relations in Neighbor Editor

You can make non-mutual neighbor relations mutual or the other way around, and remove relations completely, in the **Neighbor editor**. A removed relation is moved away from the ⑤ Neighbors list.

Prerequisites

The neighbor relation to modify or remove is defined in the project.

Procedure

Do as follows to modify or remove neighbor relations from the neighbor editor:

1. Select **Analysis↗Neighbor editor** to open the **Neighbor editor** window.
2. Select a source cell by left-click in the ② All cells list and locate the relations in the list of ⑤ Neighbors.
3. To make a non-mutual relation mutual, you can either use an arrow to move the missing part of the two-way relation into the ⑤ Neighbors list, or right-click the non-mutual relation in the ⑤ Neighbors list and select **Make neighbors mutual**.
4. To make a mutual relation non-mutual, you can either use an arrow to move the non-wanted part of the two-way relation away from the ⑤ Neighbors list, or right-click and select **Make neighbors non-mutual** (removes the source cell from the neighbor list of the target cell) or **Remove neighbors** (removes the target cell from the neighbor list of the source cell).
5. To remove one or more mutual relations completely, you can either use arrows to move both parts of the two-way relation away from the ⑤ Neighbors list, or right-click and select **Remove mutual neighbors.**
6. Click **Apply** to preserve the new neighbor settings in the project.

9
Working with Maps and Map Layers

This chapter describes how to work with map layers and map tools in TEMS CellPlanner projects.

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About Map Layers

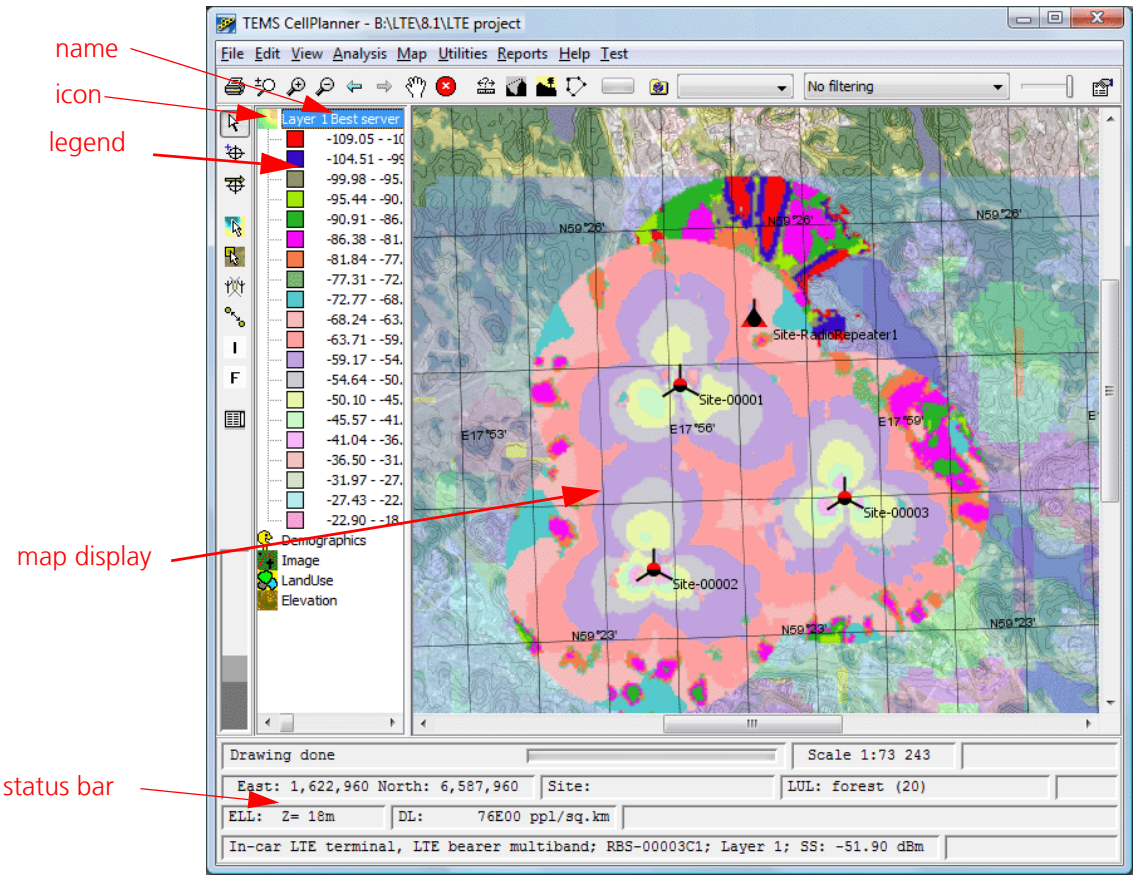
TEMS CellPlanner allows you to combine an arbitrary number of map layers (described in the *TEMS CellPlanner GeoData User's Guide*) on The Map Display and to include map layers in calculations.

Read more in Displaying Map Layers and Considering Map Layers in Calculations.

The Map Display

Each map layer is recognized by its name and icon. The color coding of each map layer is shown in the **legend** panel. Layer specific values are shown on the **status bar**, for the bin where the cursor is placed. The properties of each layer can be edited from the **Map properties** window and from the **legend** panel.

The screenshot below includes the following layers: Plot (from LTE analysis), demographics (covering part of the area), image, landuse, elevation, network layer (with sites) and grid.



Displaying Map Layers

Map layers are displayed in the The Map Display. You control which layers to display from the **Map properties** window. Here you can add, remove, hide, show and edit map layers and their order of appearance. See Add Map Layers for Display.

Three types of map layers can be displayed:

Geodata	Elevation, landuse, image, and other imported map types. See also Considering Map Layers in Calculations.
Overlaid layers	Grid, network layer with sites and polygons
Plots	Results from pathloss calculations or other analysis.

Considering Map Layers in Calculations

To use geodata map layers as input to analysis, you must include the map layers in the Project settings, as described in chapter *"Setting up Projects"*, section *"Add Map Layers to Projects"* in the *TEMS CellPlanner Common Features User's Guide*.

Any map type except for demographics (limitation in current release) can be considered in calculations. See *map types* and *demographics* in the *TEMS CellPlanner GeoData User's Guide*.

Note: *To also display map layers, you must explicitly select them for that purpose, see* Displaying Map Layers.

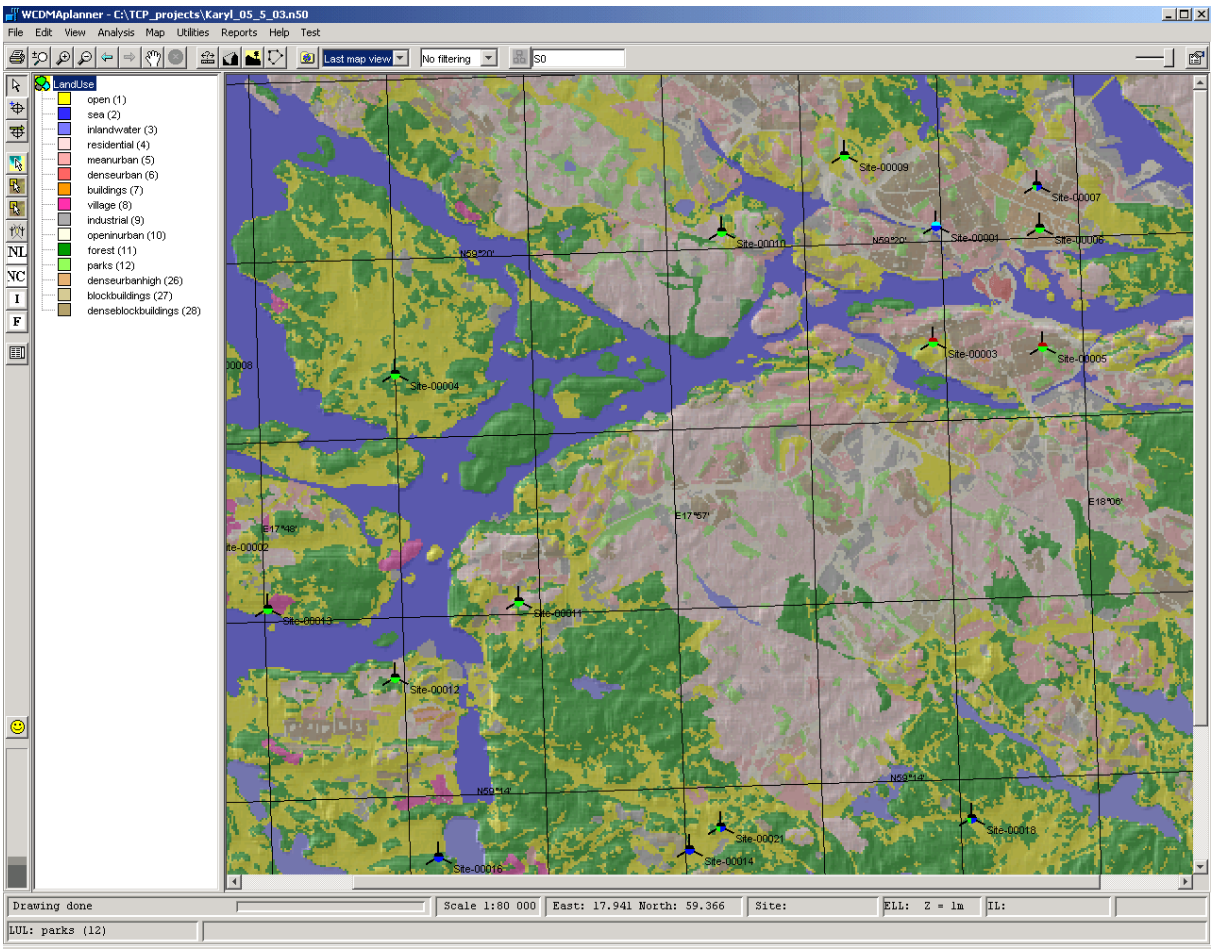
Suggested Map Layer Combinations

The following layer combinations provide different views using map data. Create these combinations and then save them as favorite views. When you load a favorite view, the **Map properties** window list changes immediately.

Land Use Prominent View

The land use prominent view shows the following layers:

- Grid
- Network
- Landuse, lookup rendering, with transparency = 65%
- Elevation, relief rendering, with saturation = 0 (gray)



Elevation Prominent View

The elevation prominent view shows the following layers:

- Grid
- Network
- Elevation, continuous rendering, with transparency = 70%
- Elevation, relief

Notice that this view includes two different types of renderings of an elevation map. The type of rendering is selected when you add the layer.

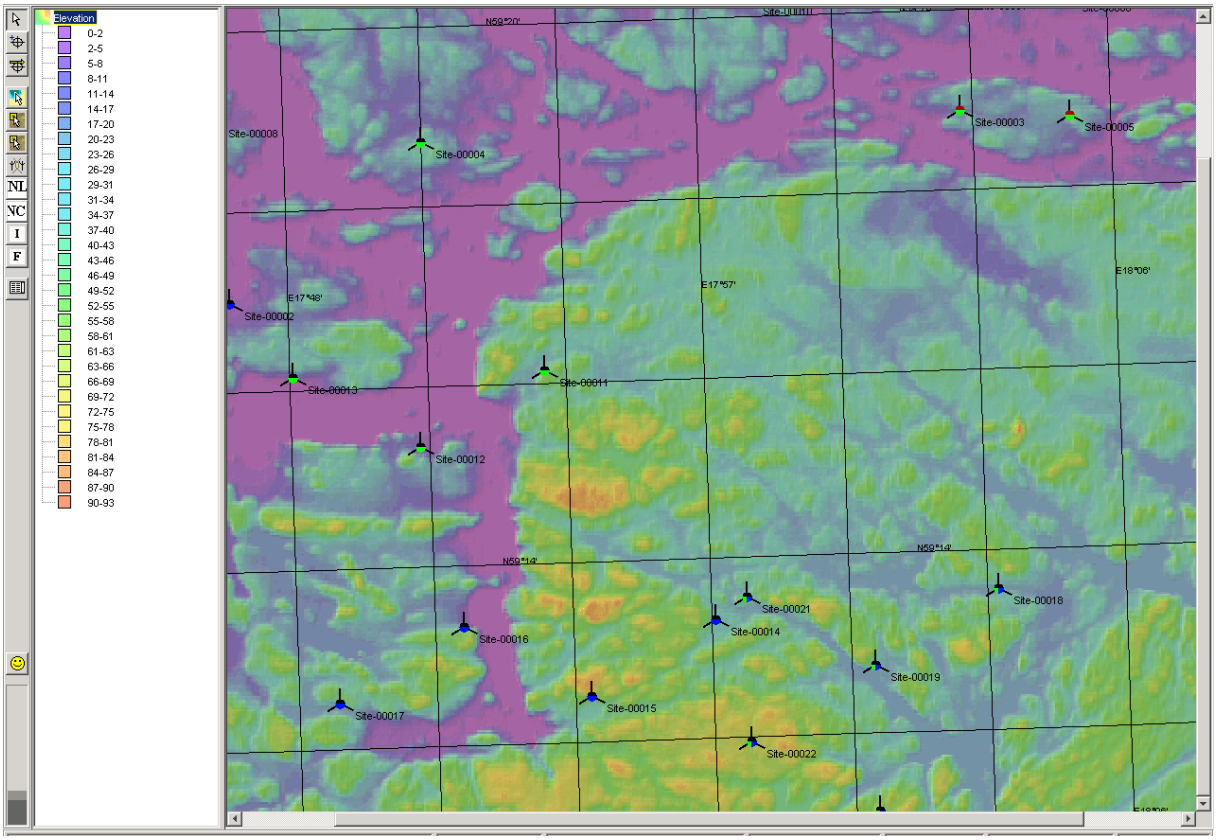


Image Prominent View

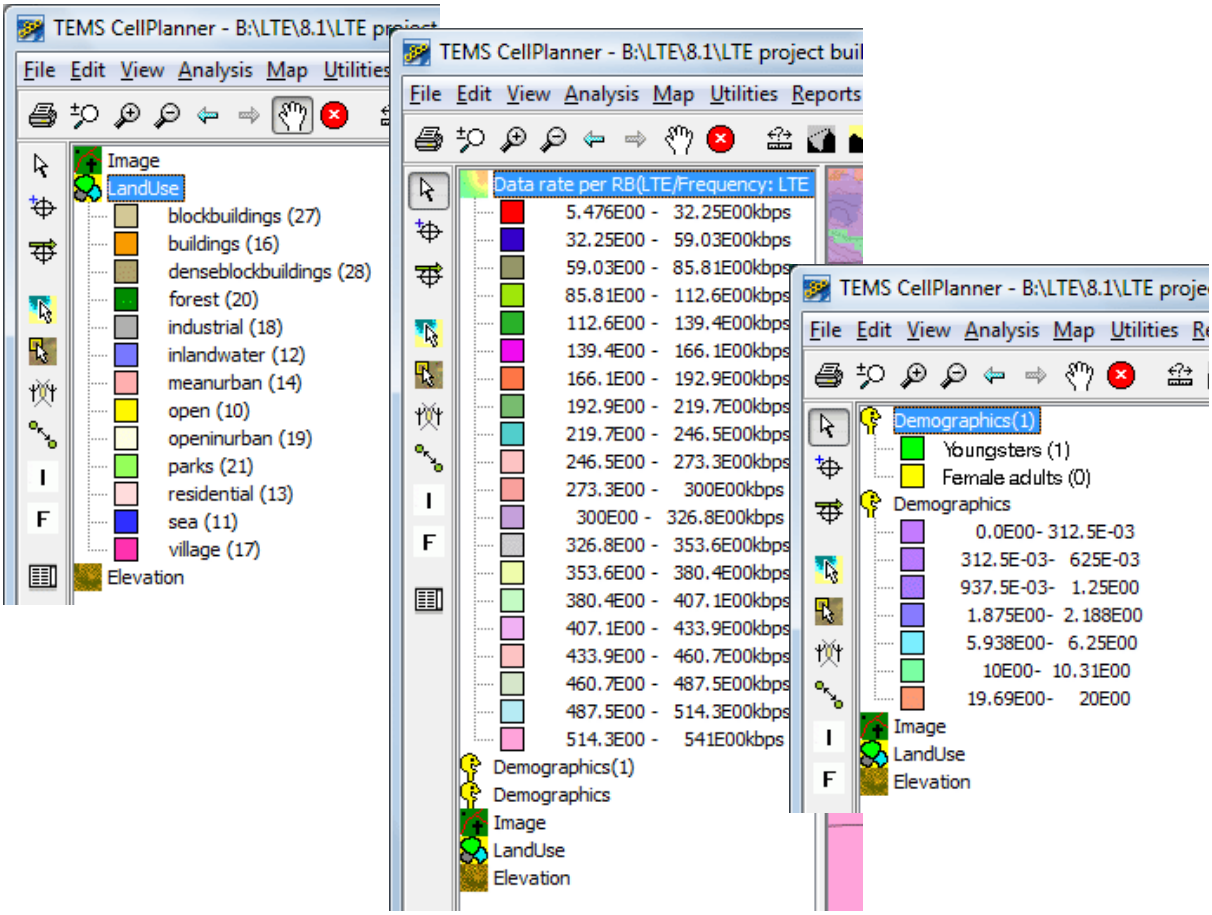
The image prominent view shows the following layers:

- Grid
- Network
- Image, with transparency = 50%
- Landuse, with transparency = 50%
- Elevation

Map Legends

Plot results, landuse codes, traffic density, demographics and other map layers with quantitative values are color coded on the map display. The Legend panel on the left side of the map display shows per map layer the values or intervals of each color.

The screenshots below exemplify legends of landuse codes, plot values, and demographics.



Show or Hide Map Legend Panel

To show or hide the legend panel you can either drag the line to the left of the map display, or enable or disable **View↗Legend.**

Show or Hide Color Code Values

To show or hide color code values of a map layer, double-click on the map layer object in the Legend panel.

Edit Legend Properties

You can modify map layer colors, ranges, transparency, rendering, and so on, from the Legend panel.

Right-click in the Legend area of the map layer and select **Edit** to change the properties window of the map layer.

Generate Screen Statistics Report

You can save the legend values in an MS Excel report, and optionally correlate to values of another map layer.

Right-click in the legend area, select **Statistics**, and enter parameters as required.

Note that the screen statistics is based on the rendered plot resolution. The screen statistics thus depend on the zoom level, as the zoom level affects the rendered resolution.

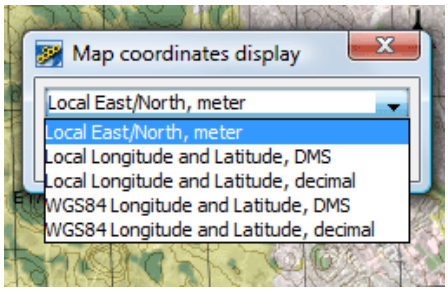
Map Display Properties

Use the procedures in this section to select which map layers to show, the rendering to use per map layer, and the coordinate system to use for display.

View or Modify Coordinates Display Representation

Use this procedure to view an modify how coordinates are represented in map displays, explorers, and importing and exporting coordinates to/from a project.

1. Select Map↗Display properties↗Coordinate display... The available coordinate system representations appear in the Map coordinates display window, with the current selection highlighted:


Map coordinates display
Local East/North, meter
Local East/North, meter
Local Longitude and Latitude, DMS
Local Longitude and Latitude, decimal
WGS84 Longitude and Latitude, DMS
WGS84 Longitude and Latitude, decimal

2. Select the desired coordinate system representation.
3. Click OK to save the changes and return to the Map properties window.

The following representations are available:

Coordinate system representation	Displays coordinates in...
Local East/North, meter	...meters, using the coordinate system of the map
Local Longitude and Latitude, DMS	... longitude and latitude in local datum in Degrees Minutes Seconds (sexagecimal representation)
Local Longitude and Latitude, decimal	... longitude and latitude in local datum in degrees (decimal representation)
WGS84 Longitude and Latitude, DMS	... longitude and latitude in WGS84 datum in Degrees Minutes Seconds (sexagecimal representation)
WGS84 Longitude and Latitude, decimal	... longitude and latitude in WGS84 datum in degrees (decimal representation)

Add Map Layers for Display

You can use the same map data in different map layers of different renderings. For example, you can add a continuous rendered elevation map layer to the project in addition to a relief rendered elevation map layer.

Follow these steps to add and select map layers to be displayed:

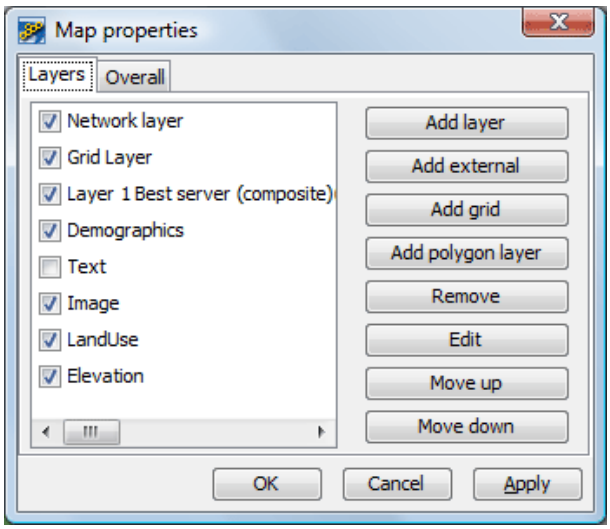
1. Select **Map↗Display properties↗Map properties** window or click . The **Map properties - Layers** window appears.
2. Select the **Layers** tab.
3. Click **Add layer** to add new map layers for selection. The **Select from project maps** window appears, listing the map layers in the Project settings, which will be used for pathloss predictions. Select the map layers to add for display.
4. Optional: To display other map layers than the ones included in the Project settings, click **More...** and select map layers from the map root directory.

   Note: *To include these map layers in pathloss predictions as well, see* Considering Map Layers in Calculations.

5. Optional: To display map layers located somewhere else than in the map root directory, click **Add external** and select map layers from another folder.

   Note: *These map layers **can not** be used for pathloss predictions as they are not located in the map root directory. See* Considering Map Layers in Calculations.

6. Use the check boxes to select map layers to display:



7. Click **Apply** to update the map display.
8. Click **OK** to close the window.

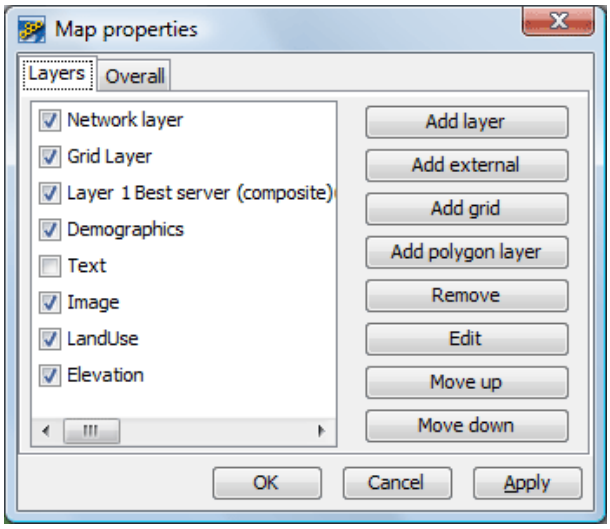
Fields on Window “Map properties - Layer”

(list of map layers)	Lists the loaded map layers
Add layer	Add map layers from the map root directory
Add external	Add map layers from an another folder than the map root directory
Add grid	Add grid layer to the map layers
Remove	Remove layers
Edit	Edits selected layer
Move up	Move layers up in the display
Move Down	Move layers down in the display

Edit Map Layer Properties

Follow these steps to edit display properties of individual map layers:

1. Select **Map↗Display properties↗Map properties** window or click .
2. Select the **Layers** tab. The so far added map layers are listed:



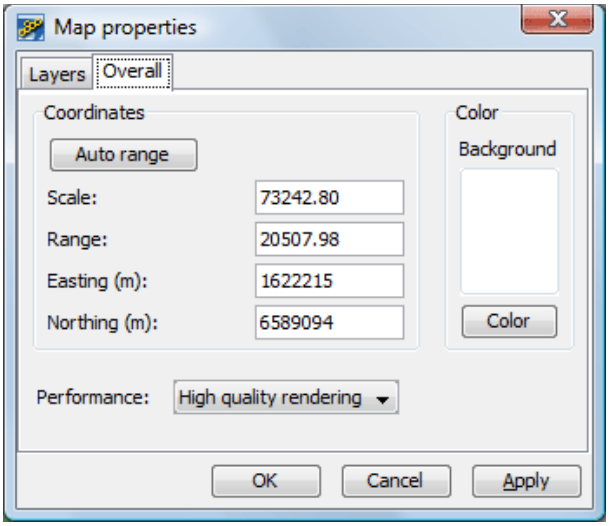
   See button descriptions in Fields on Window “Map properties - Layer”.

3. Highlight the map layer you want to change and click **Edit** to display a window for editing the map layer properties.
4. Change the map layer properties as desired.
5. Click **OK** to save the changes and return to the **Map properties** window.

Change Overall Settings of the Map Display

Follow these steps to change the map display settings, such as scale, range, offset, colors or rendering performance, or to center the map display.

1. Select **Map↗Display properties↗Map properties** window or click .
2. Click the **Overall** tab to view the map display settings.



3. Modify the settings as desired and click **Apply** to update the map display.
4. Click **OK** to save the settings and close the window.

Fields on Window "Map properties - Overall"

AutoRange	Updates the map display to an applicable scale and scope for newly loaded layers.
Scale	Map scale used for the loaded layers
Range (m)	Scope in meters of the map layers used
Longitude (*)	Longitude of the map layers
Latitude (*)	Latitude of the map layers
Color	Changes the color of the world background on which all layers reside.
Performance	Changes the speed of displaying layers, called rendering: • High quality rendering takes the longest • Fast rendering produces lower quality resolution • Normal rendering, compromise between speed and quality.

Center Map Display

Use this procedure to dimension the map display for all selected map layers.

1. Select **Map↗Display properties↗Map properties** window or click .
2. Click the **Overall** tab to display information to view the map display settings, see Change Overall Settings of the Map Display.
3. Select **AutoRange** and click **Apply** to center the map around all map layers.

Alternatives:

- To center around a *site*, open the **Site explorer** and select **Locate in map**.
- To center around a *polygon* area, edit the polygon layer and select **Center on map**. See Add Polygon Map Layer.

Hide and Show Layers

You might not want to display all layers in the map display at the same time. Instead of removing the layer you can hide it.

To hide a layer do either of the following:

- Clear the layer's check box in the **Map properties** window and click **Apply**.
- Right-click in the map display and select **Hide layer↗*<layer name>***.

To show a layer, do either of the following:

- Select the layer's check box in the **Map properties** window and click **Apply**.
- Right-click in the map display and select **Show layer↗*<layer name>***.

Each map layer is opaque by default and obscures the layers beneath it. You can modify the transparency and the order of the layers to emphasize the most important layers.

Remove Map Layers

To persistently remove a map layer, do as follows:

1. Select **Map↗Display properties↗Map properties** window or click .
2. Select the **Layers** tab.
3. Select a layer and click **Remove**.
4. Click **Apply**. The display is updated.

As a smoother alternative to permanent removal, you can temporarily hide a map layer, see Hide and Show Layers.

Add Polygon Map Layer

Use the polygon map layer function to display multiple areas or polygons at the same time. The lines defining the polygons can be distinguished by changing line properties like color and width, and line types. Any number of areas (polygons) can be selected for the polygon layer.

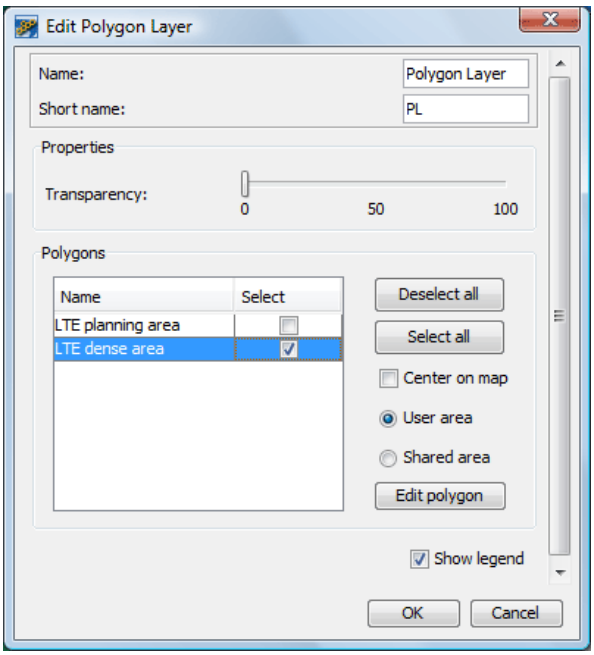
Prerequisite

One or more areas must already be defined using Map↗Area editor.

Procedure

Follow these steps to add a polygon layer to the map display:

1. Select Map↗Display properties↗Map properties. The Map properties window is displayed.
2. Click Add polygon layer. The Edit polygon layer window is displayed showing a list of predefined areas or polygons.



3. Select the areas and polygons to include in the polygon map layer. If you want to select areas defined for all users of the project, select Shared area.
4. Optional step: To distinguish between areas more easily, you can edit the properties of the lines used to display each area.
5. Select Center on map to center the polygon shapes and adapt the scale of the map to fit all polygons in the map view.

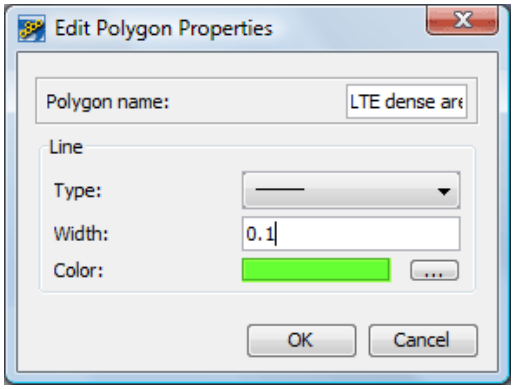
6. Click **OK** when you are satisfied with the polygon layer settings. The **Map properties** window is displayed again. Click **OK** to apply the polygon map layer to the map display and close the **Map properties window**.

Fields on Window "Edit polygon layer"

Name	Your full name for the polygon layer
Short name	Your short name for the polygon layer.
Transparency	Controls visibility of the polygon layer in the map display
Polygons	Names of areas available to display in the polygon layer. The names are the names of areas you previously defined
Deselect all / Select all	Selects or deselects all areas listed
Center on map	Centers the polygon shapes and adapts the scale of the map to fit all polygon shapes in the map view
User area	Shows all areas defined by you
Shared area	Shows all areas defined for all users of the project
Edit polygon	Displays the **Edit polygon properties** window for the polygon selected in the list
Show legend	Displays the properties of the selected polygons in the map legend

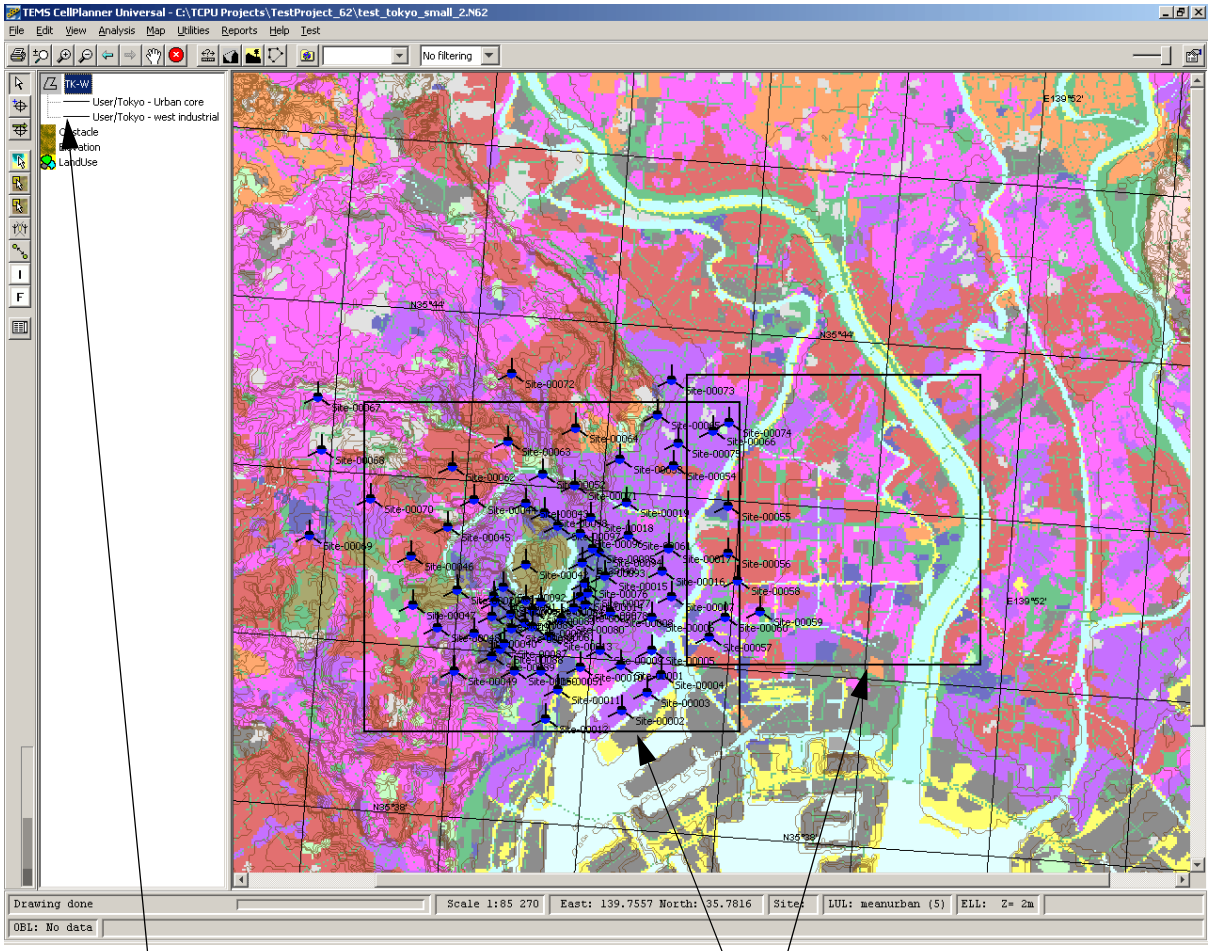
Polygon Properties

Use the **Edit polygon properties** window to change the style and color of the lines displayed for each polygon



Example: Polygon Layer in Map Display

The following example shows the polygon layer in the map display:

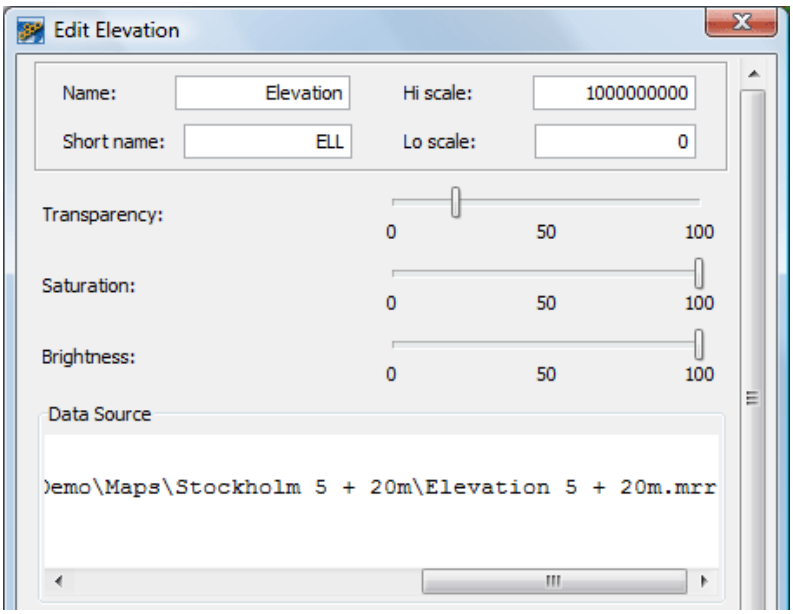


Edit Elevation Layer Properties

The elevation layer properties depend on the selected display method, that is, the rendering. Do as follows to change the elevation layer properties:

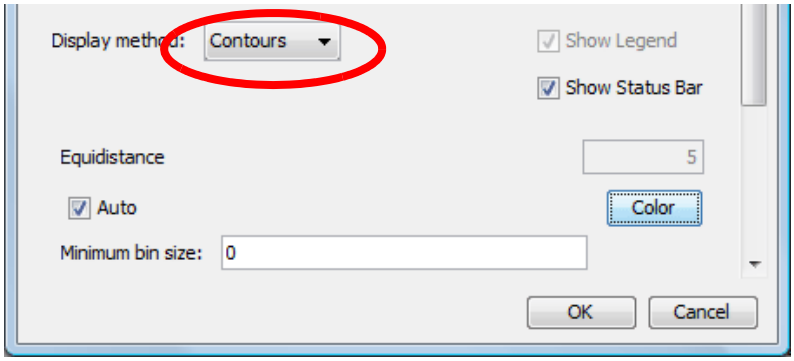
1. Select **Map↗Display properties↗Map properties** window or click .
2. Select the **Layers** tab.

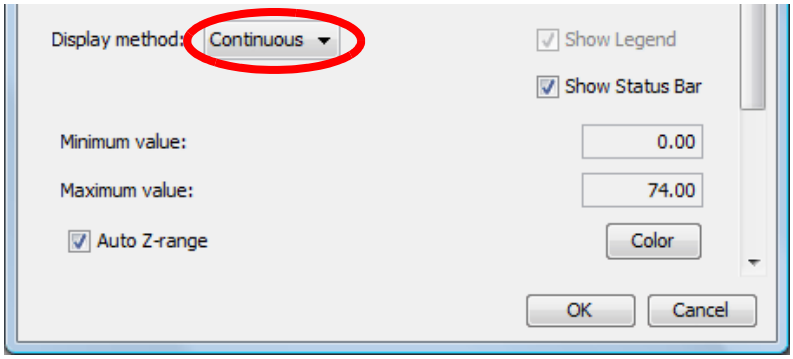
3. Select an elevation layer and click **Edit**. The **Edit Elevation** window appears. The upper part of the **Edit Elevation** window shows parameters common to all display methods as in the following example:

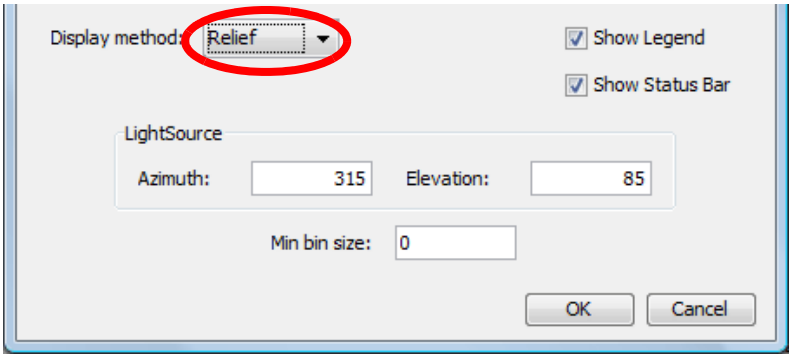


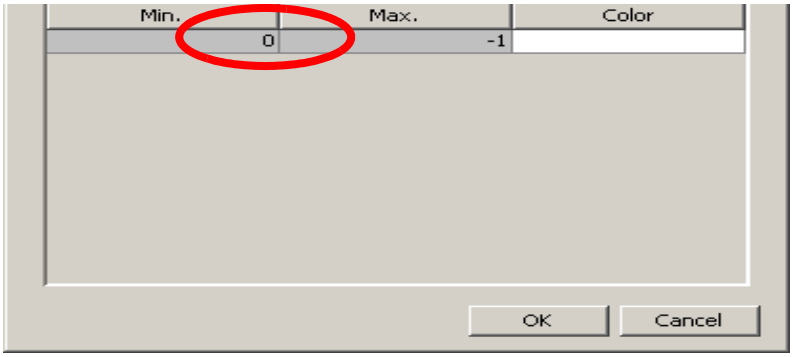
4. Modify rendering independent parameters as required, see Elevation Layer Properties - Rendering Independent.

5. Select desired **Display method**. The rendering specific parameters appear in the lower part of the window as in the examples below:









6. Modify the rendering specific parameters as required, see:
   - Elevation Layer Properties - Contour Rendering
   - Elevation Layer Properties - Continuous Rendering
   - Elevation Layer Properties - Relief Rendering
   - Elevation Layer Properties - Threshold Rendering
7. In the **Map properties** window, click **Apply** to update the map display.

Elevation Layer Properties - Rendering Independent

Name	Full name of the elevation layer
Short name	Abbreviated name of the elevation layer
Hi scale	Upper scale used for the layer. Defines the high end of the range in which height information is visible.
Lo scale	Lowest scale used for the layer. Defines the low end of the range in which height information is visible.
Transparency	Transparency of the layer, by default set to 0%, making the layer as opaque as possible on top of other layers. Move the control to 70% to make the elevation layer only 30% opaque
Saturation	Depth of color used in the map. The amount of pure hue in the color displayed, where the default is 100%. If set to 0%, the result is a grayscale color that can provide value contrasts beneath a colored layer above, such as a landuse layer.
Brightness	The amount of light in the color, by default 100%.
Data source	Search path for the map data
Display method	The method used for displaying the layer: Contours
Show legend	Displays the legend of the map layer
Show status bar	Displays the Z coordinates on the status bar

Elevation Layer Properties - Contour Rendering

Equidistance	Contour lines equidistance in meters
Auto	Uses only active values when calculating equidistance, the equidistance is automatically calculated.
Color	Set color hues for map.
Minimum bin size	In contour rendering, contour lines may, for some data, look square. This problem is caused by over-sampled elevation data, for example, when a 20m database is created from a 50m database without interpolation. Use this field to set a new minimum bin size for calculating enhanced contour lines so that they appear rounded instead of squared.

Elevation Layer Properties - Continuous Rendering

Minimum value	Minimum Z value displayed
Maximum value	Maximum Z value displayed
Auto Z-range	Adjusts the Z range of the map display
Color	Set color hue for map

Elevation Layer Properties - Relief Rendering

Azimuth	Azimuth of the light source for the relief rendering.
Minimum value	Minimum Z value displayed
Maximum value	Maximum Z value displayed

Elevation Layer Properties - Threshold Rendering

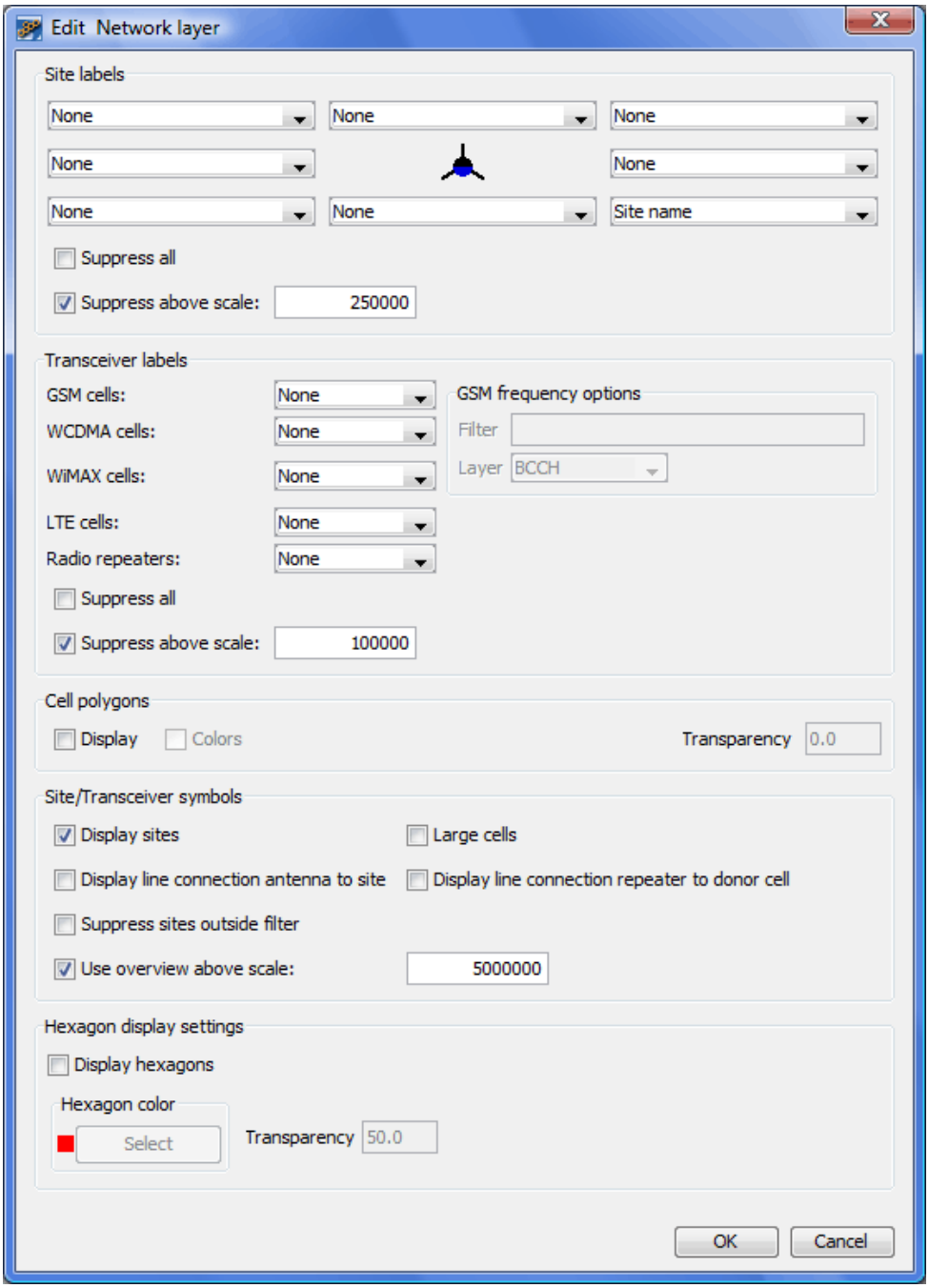
Min	Minimum color variation for the map layer
Max	Maximum color variation for the map layer
Color	Color used on map layer.

Edit Network Layer Properties

Follow these steps to change network layer properties:

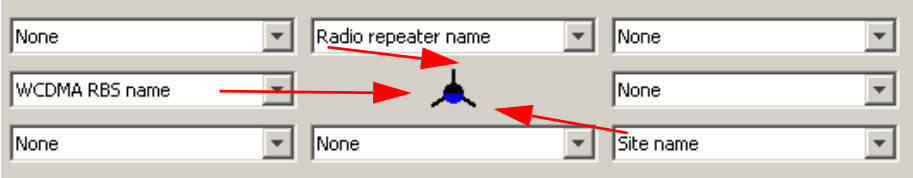
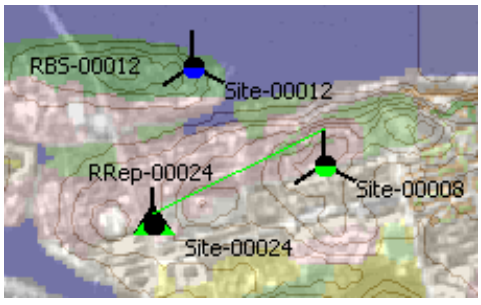
1. Select Map↗Display properties↗Map properties window.
2. Select the Layers tab.

3. Highlight **Network layer** in the list of map layers, and click **Edit**. The **Edit Network layer** window appears.



4. Change the layer properties as desired, see parameter descriptions on subsequent pages.
5. Click **OK** to save the changes and update the map display.

Site Labels on Window "Edit Network layer"

Field	Description
(Placement area)	Sets the placement and contents of site labels. The fields around the site symbol illustrates where the text will be placed in the network layer map display in relation to the site symbol. Selectable labels: • None - no label displayed • GSM RBS ID • GSM RBS name • LTE RBS name • LTE fixed subscriber name • Radio repeater name • Site name • WCDMA RBS name • WiMAX RBS name • WiMAX fixed subscriber name In the example below, the network layer will place the text as follows, in relation to the site symbol: • WCDMA RBS name to the west (if the site includes a WCDMA RBS) • radio repeater name to the north (if the site includes a radio repeater) • site name south-east of the site  Using the settings above, the map display might look as in the example below. Here we have one WCDMA site, one GSM site and one radio repeater site, where parameter **Display line connection repeater to donor cell** is set: 
Suppress all	Hides all site labels
Suppress above scale	Hides site labels when map scale above this value

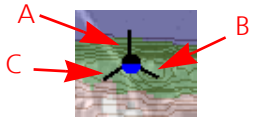
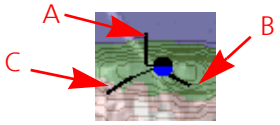
Transceiver Labels on Window "Edit Network layer:

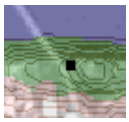
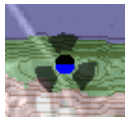
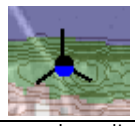
GSM cells	Selects GSM cell label, either of: • Cell name • Frequencies • None
GSM frequency options	These fields are activated when you select **Frequencies** as the GSM cell label. • Filter - range of visible frequencies • Layer - the GSM carrier layer, either of *BCCH*, *BCCH and BSIC*, *BCCH and TCH* or *TCH*
WCDMA cells	Selects WCDMA cell label, either of: • Cell name • Scrambling code • None
WiMAX cells	Selects WiMAX cell label, either of: • Cell name • None
LTE cells	Selects LTE cell label, either of: • Cell name • None
Radio repeaters	Selects radio repeater label, either of: • Donor cell • None
Suppress all	Hides all transceiver labels
Suppress above scale	Hides transceiver labels when map scale exceeds this value

Cell Polygons Fields on Window "Edit Network layer"

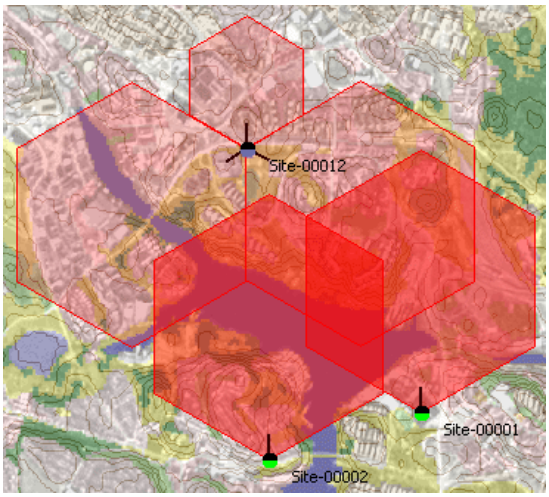
Display	If selected, cell polygons are displayed in the network layer
Color	If selected, cell polygons are filled with random colors
Transparency	Transparency of displayed cell polygons

Site/Transceiver Symbols on Window "Edit Network layer"

Field	Description
Display sites Here you configure the appearance of each radio technology's site symbol	Displays the center part of the site symbols (the "spot) in the network layer. Antennas (the "sprouts" around the spot) and text are displayed irrespective of the setting of this option. The examples below show the site symbols with default settings. The WCMDA, GSM and WiMAX RBS sites all have three antennas of different azimuth: LTE RBS site (red spot): LTE fixed subscriber site (red spot): WCDMA site (blue spot): GSM site (green spot): WiMAX RBS site (brown spot): WiMAX fixed subscriber site (red spot): Radio repeater site (black spot with triangle corresponding to the radio technology of the donor cell, here GSM):
Display line connection antenna to site	Shows a line connection between antenna and site. Example 1: Site and antennas in the same location  Example 2: Site with antennas A and C in different locations than the site 

Field	Description
Suppress sites outside filter	Affects the appearance of the site symbol and the text selected in the **"Placement area"**, for sites excluded by a filter. If selected, excluded sites are completely invisible. Neither the sites symbols, antennas nor text are displayed. If not selected, excluded sites are hardly visible. The site symbols are grayed out, the antennas are not displayed but the text is displayed.
Use overview above scale	Normal site symbols (spots) replaced by overview symbols (dots) when the map scale exceeds this value. Example: 
Large cells Here you configure the appearance of each site's antenna symbol	If selected, displays large antennas. If not selected (default), displays thin antennas. Examples: Large cell:  "Small" cell: 
Display line connection repeater to donor cell	Shows a line between each radio repeater and its donor cell. Example:

Hexagon Display Settings on Window "Edit Network layer"

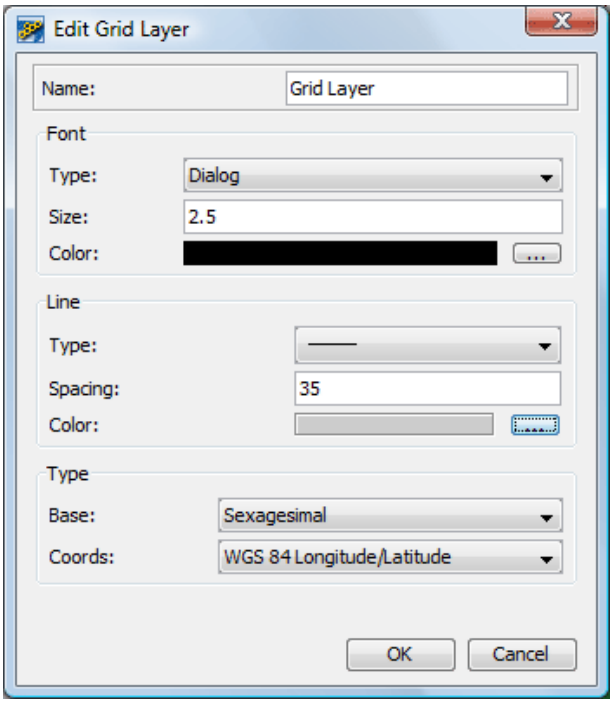
Field	Description
Display hexagons	Displays the ideal coverage as cell hexagons in the network layer. In the example, the A antenna of Site-00012 has a smaller cell radius than antennas B and C transmitting in other directions, and the antennas of the other sites are transmitting in the same direction (same azimuth). 
Hexagon color	Sets the color of the cell hexagons. Default: Red.
Transparency	Sets the transparency of the cell hexagons. Default: 80%.

Edit Grid Layer Properties

In addition to the world coordinate map, you can add a local grid. Follow these steps to add a grid layer:

1. Select **Map↗Display properties↗Map properties** window or click .
2. Select the **Layers** tab.

3. Click **Add Grid**. The **Adding GridLayer** window appears.



4. Define the properties for the grid.
5. Click **OK** to close the window. In the **Map properties** window, click **Apply** to update the map display.

Fields on Window "Edit grid layer"

Short name	A short name for the layer display.
Name	The full name of the layer display.
Type	The type of font.
Size	The font size.
Color	The font color.
Type	Type of grid pattern
Spacing	The spacing of the grid lines.
Color	The color of the lines of the grid.
Base	Type of coordinate base used in the grid.
Coords	Type of local coordinates used in the display.

Edit Demographic Layer Properties

The demographics layer (see *map type, demographics* in the *TEMS CellPlanner GeoData User's Guide*) can be configured to display either of the following:

- the dominant category of each bin
- the population density of a selected category

Prerequisites

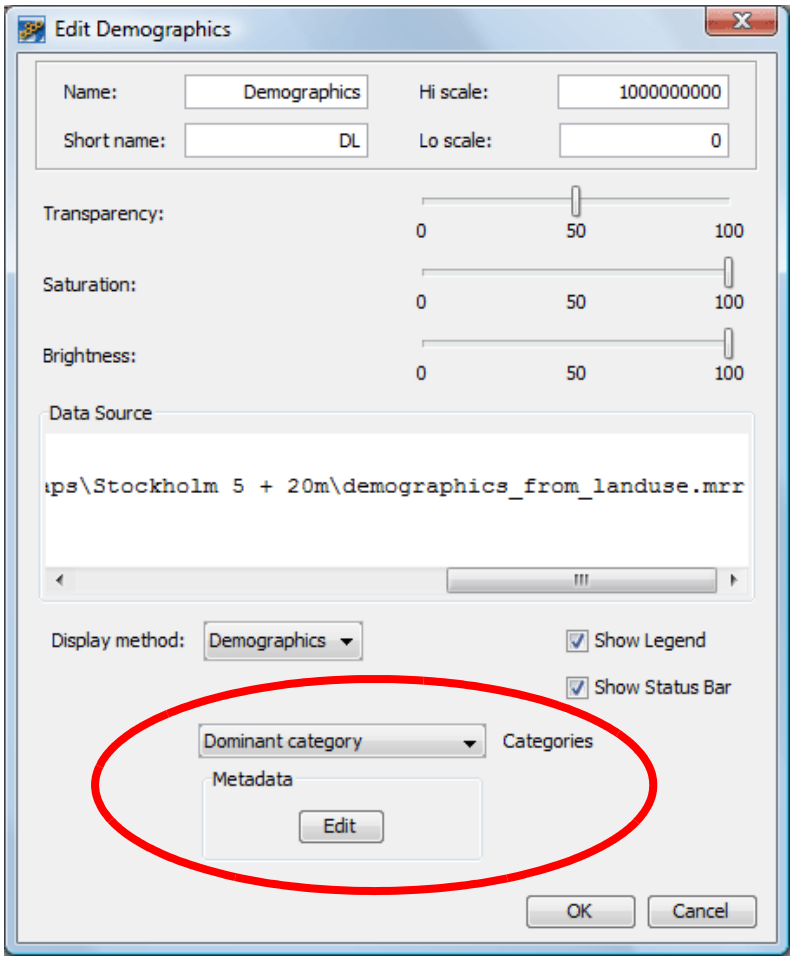
The map properties include a demographics map layer, see Add Map Layers for Display.

Procedure

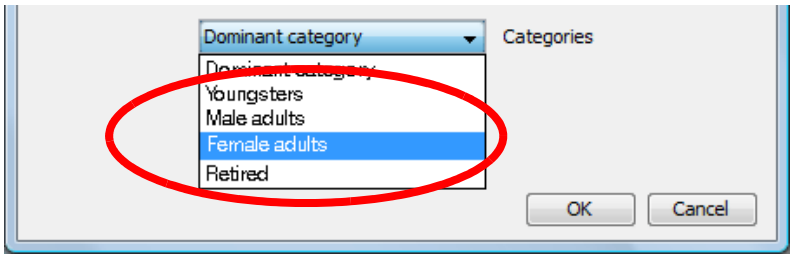
Do as follows to edit the demographics layer:

1. Select **Map↗Display properties↗Map properties** window or click .
2. Select the **Layers** tab.
3. Highlight the **Demographics** layer.
4. Click **Edit**. The **Edit Demographics** window appears.

5. To display *all categories at the same time, with the category of highest population density only displayed in each bin*, select **Dominant category** as follows. Here you can also **Edit** the color settings as metadata.



6. To display *one category only in all bins*, select a category from the list of **Categories** as in the following example:



7. Click **OK** to close the window. In the **Map properties** window, click **Apply** to update the map display.

Fields on Window “Edit demographics”

Name	Full name of the demographics map layer
Short name	Abbreviated name of the demographics map layer
Hi scale	Upper scale used for the layer. Defines the high end of the population density to display.
Lo scale	Lowest scale used for the layer. Defines the low end of the population density to display.
Transparency	Transparency of the layer
Saturation	Depth of color used in the map
Brightness	Brightness of map color
Data source	Search path for the map data
Display method	The rendering used for displaying the layer, depending on the choice of **Categories**: • **Dominant category** - lookup rendered • <specific category> - threshold rendered
Show legend	Shows the Map Legends of the map layer, with color codes listed depending on the choice of **Categories**. • **Dominant category** - colors of all categories • <specific category> - colors per population density interval of the selected category
Show status bar	Shows the population density on the status bar, depending on the choice of **Categories**. • **Dominant category -** the status bar shows which category is dominant in the indicated bin • <specific category> - the status bar shows the population density of that category in the indicated bin
Categories	Possible categories to display. Select one of: • **Dominant category** - displays per bin the category with the highest population density • <specific category> - displays this category only
Edit	Edit color settings as metadata. Available only when **Dominant category** selected.

Zoom and Pan

The scope of the map shown in the display determines the area saved in a favorite view, or the area printed for a network design. For landuse, image, or vector data, you can magnify or zoom in on the view to ensure accurate placement of sites.

With any of the zoom features, click the arrow icon to re-activate the Selection arrows.

None of the functions at the vertical toolbar work simultaneously with tools in the horizontal toolbar.

Zoom in

Zooming in on a map magnifies the view so you can see details more clearly.

1. Click the Zoom in icon in the horizontal toolbar to change the cursor to the magnifier + cursor.
2. Click and hold the cursor on a position and drag it to create a highlighted rectangle of the area to magnify.
3. Release the mouse button and wait until the magnified view is displayed.

Zoom Out

Zooming out on a map display shrinks the view so you can see a larger area more clearly.

1. Click the Zoom out icon in the horizontal toolbar to change the cursor to the magnifier - cursor.
2. Click and hold the cursor on a position and drag it to create a highlighted rectangle of the area to reduce.
3. Release the mouse button and wait until the reduced view is displayed.

Cancel Zoom In or Zoom Out

If you accidentally zoom in or out too much, you can cancel the display of the view and re-display the previous view. This can save time, especially if the project has many maps and sites to resize.

Click the Cancel action icon or select Map↗Stop drawing. The map display stops and the previous map is re-displayed.

Continuous Zoom

You can continuously zoom and pan the map using the icon .

1. Pan by clicking with the left mouse button in the map.
2. Zoom in by clicking with the right mouse button in the map and moving the cursor upwards. Zoom out by moving the cursor downwards.
3. Freeze the map at the selected scale by pressing **Enter**.

Pan the Map Display

Use panning to move the position of the map within the current map display area. The panning is useful to change the center of the view or to ensure that you include specific sites within the view.

1. Click the **Pan** icon in the horizontal toolbar.
2. Click and hold the cursor on the map display and drag it in the direction to move the map. For example, move the cursor towards the top of the screen to move the map view up.

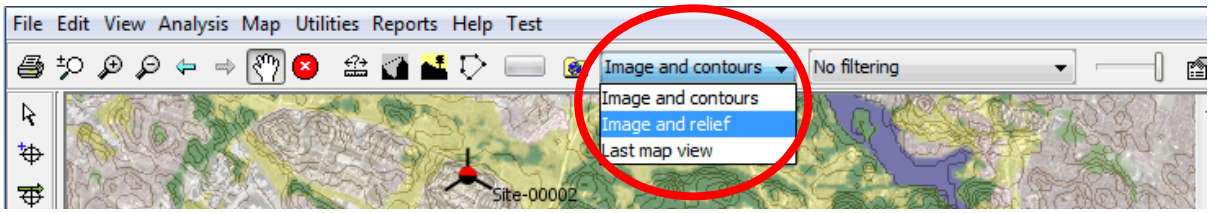
Map Favorites

You can save zoom level and visibility of layers as a favorite map view and select that view any time you open the project.

Select Map Favorite

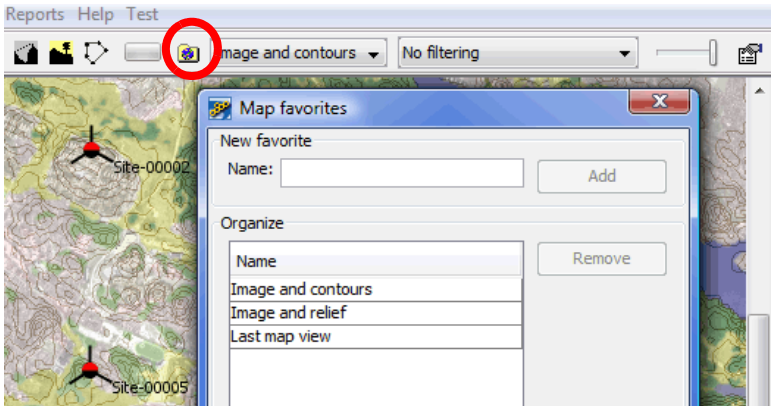
The top bar of the map display window contains a drop down menu with saved map views. Select a view to refresh the map display with saved settings. The default view **Last map view** contains the settings from when you last saved the project.

Note: *Scrolling information is not stored in map views, hence you might need to scroll manually to center the map display.*



Save Map Favorite

1. Customize the map display to create a view to save. Analysis results layers and scrolling settings are not included in a saved view.
2. Click the **Map favorites** icon or select **Map↗Favorites...**. The **Map favorites** window appears:



3. Enter a descriptive **Name** for the new favorite and click **Add**. The new view is added to the **Organize** list.
4. Click **Apply** or **OK** to save the view.

Map Templates

You can save your map settings as a template to use in other projects.

Save Map Template

Follow these steps to save your map settings as a template.

1. Select Map templates↗Save...
2. Enter a template name and click OK to save the template.

Select Map Template

Follow these steps to select a map template.

1. Select Map templates↗Select....
2. Find the template to use and click OK.

Map Areas

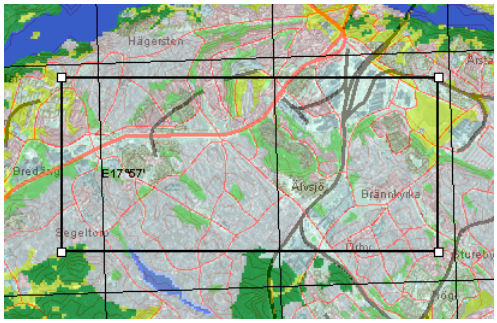
You work with sites by outlining an area and selecting all sites within that area. By defining a rectangle or polygon area, you can include and exclude specific sites from a selection. A saved area can be used in working areas.

Select Rectangle Area

Use this procedure to define map display areas with the rectangle tool.

1. Click the **Pointer** icon and select the rectangle tool.

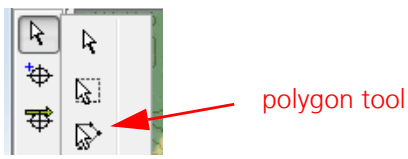
2. Press the left mouse button and drag the cursor to form a rectangle around the sites in the area. Release the mouse button to complete the selection.



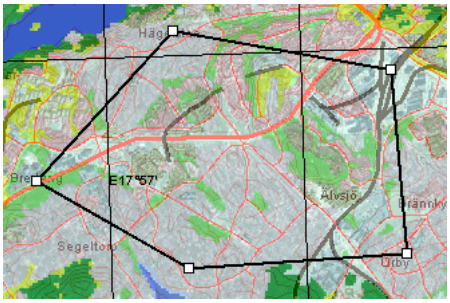
Select Polygon Area

Use this procedure to define map areas with the polygon tool.

1. Click the **Pointer** icon and select the polygon tool.



2. Click the left mouse button at a point, drag the cursor to another point, and continue with as many points as required to define a polygon around the region, ending where you started. Double-click to complete the selection.



Define Map Area

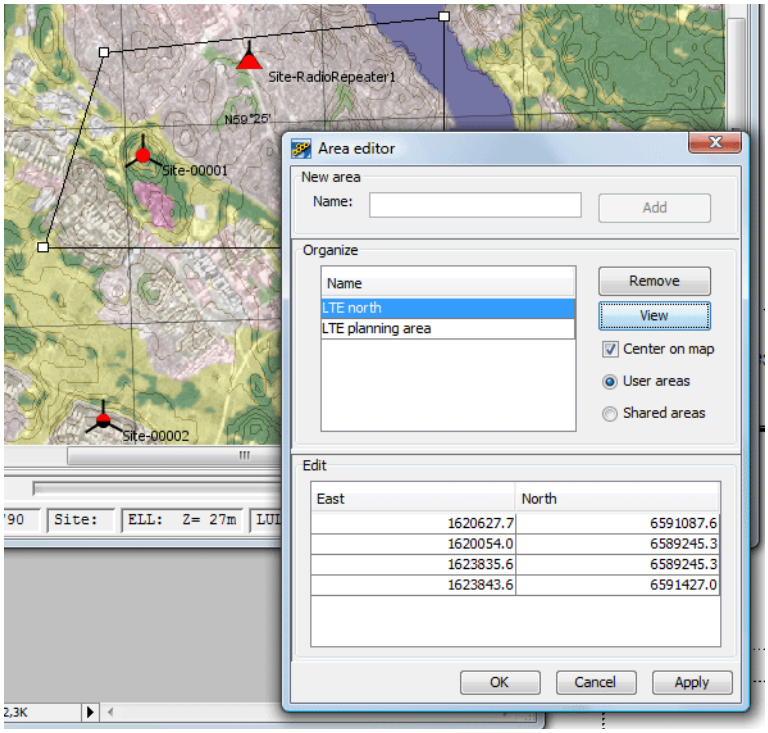
To reuse a selection of sites, surruond the sites on the map and save the area.

Procedure

Follow these steps to define map areas:

1. Select Rectangle Area or Select Polygon Area where desired.
2. Click the **Area editor** icon or select **Map↗Area editor** to open the **Area editor** window.
3. Do you want this area to be your private one, or available to anyone who opens the project?
   - To save the area as a private area, select option **User areas.**
   - To make the area available for other users, select option **Shared areas**. (Relevant if the project is saved in database via a TEMS CellPlanner Server).
4. Enter a descriptive area **Name** in the **New area** pane and click **Add**. The new area name appears in the **Organize pane**, and its coordinates are displayed in the **Edit** table.
5. To center the map area on the map display, select option **Center on map** and click **View**.
6. Click **Apply** to save the area.

7. The result might look as in the following example:



Center Map Area

You can easily center a map area on the map display.

1. Click the **Area editor** icon or select **Map↗Area editor**.
2. Select the area in the **Name** list and select option **Center on map**.
3. Click **View**. The map is updated with the area in the center of the display.

Change Map Area Dimensions

You can change the longitude and latitude values of the corner points of an area.

1. Click the **Area editor** icon or select **Map↗Area editor**.
2. Do either of the following:
   - Click **View** to show the area and drag and drop the corners to move.
   - Change the longitude and latitude values of the points in the **Edit** table.
3. Click **Apply** to save the settings.

Map Colors

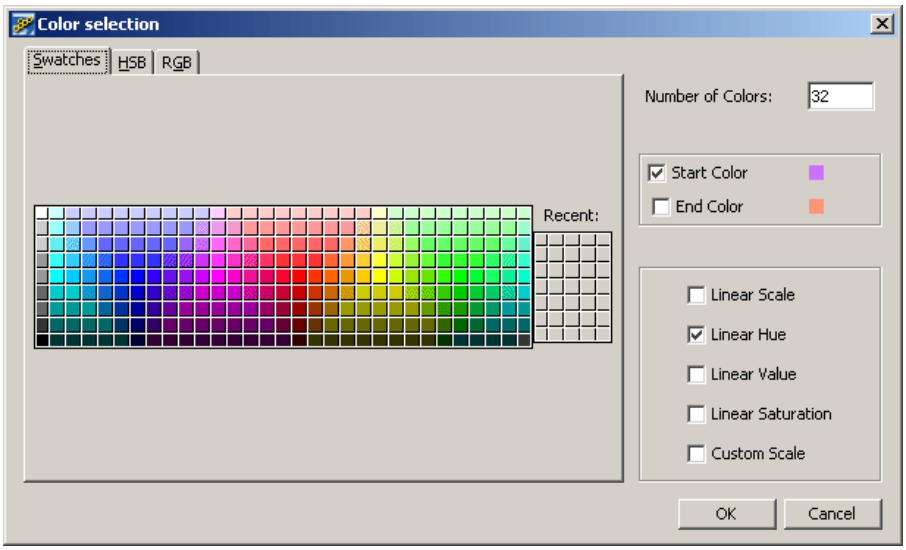
Specify Map Colors

You can change the color coding of each map layer. Data might be easier to interpret when you adjust the value ranges and colors to fit the minimum and maximum values of the real data.

Procedure

Follow these steps to use predefined map colors:

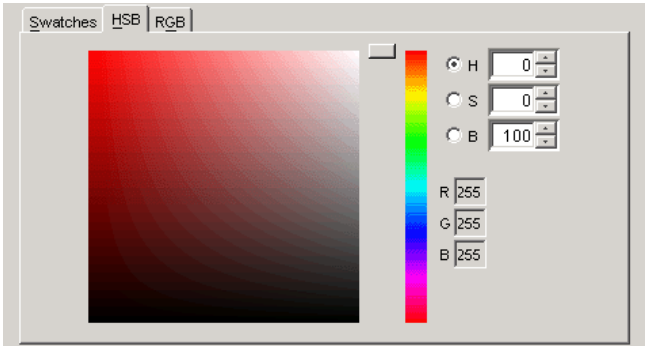
1. Select **Map properties** and highlight a map layer.
2. Click **Edit** to display the layer window.
3. In the layer window, click **Edit**. The **LookupMetaData** window is displayed.



4. In the **Swatches** window of the color window, select a color from the color palette. The selected color is shown at a larger scale in the **Preview** area.

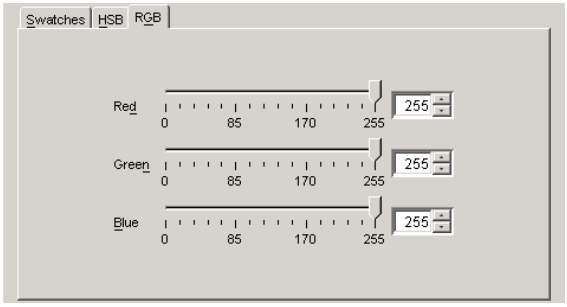
Define Color Hues

You can define a hue in the **RGB** window. Move the **Red**, **Green**, and **Blue** controls until you create a hue in the **Preview** area.



Define Hue Values

To darken or lighten a hue defined in **RGB** or selected in **Swatches**, click the **HSB** window to display the selected hue with darker and lighter values. Click in the display to select the value and see the corresponding HSB values. Saturation (**S**) indicates the amount of hue, while Brightness (**B**) indicates the amount of light. Click **OK** to save and apply the selected color.



Printing Maps

You can print TEMS CellPlanner maps on printers or plotters, or save as files. Before printout you can customize the layout and check in a **Print preview** window how settings modify the printout.

Print Map

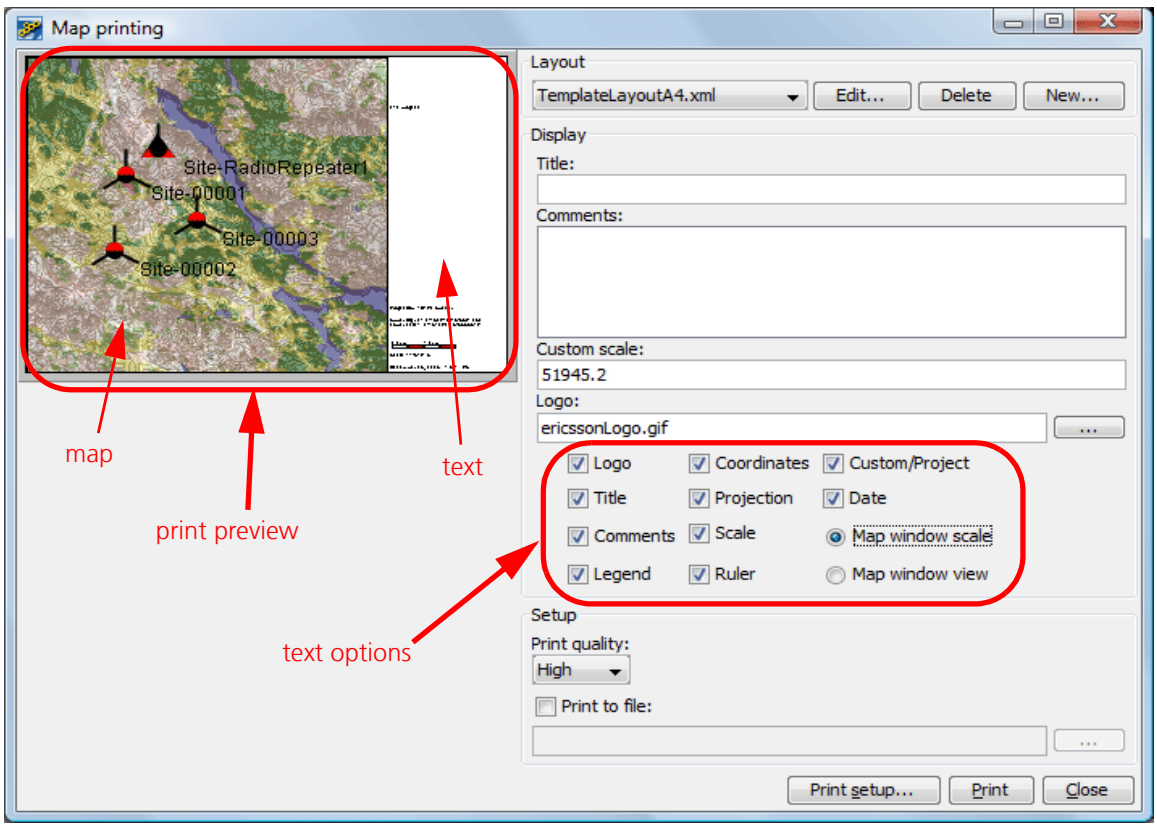
Use this procedure to prepare printout of a map and print it out to printer or file.

Prerequisites

A map is displayed in the map display.

Procedure

1. Select **File↗Print**. The **Map printing** window appears with a print preview of the printout according to the current settings:



Note that the grid layer might not be visible in the print preview, and that the text might be hard to read due to the small size of the print preview.

2. Select a **Layout** template ruling the layout of the map and text parts. You can **Edit** existing templates and create **New** ones. See also Edit Map Printing Layout.
3. Configure the printout contents, see **Text contents** and **Text options** in Fields on Window "Map printing". The print preview is updated as you change your settings.
4. Configure the printout destination, see **Printing options** in Fields on Window "Map printing". The print preview is updated as you change your settings.
5. Click **Print**. The printout is sent to the configured printer or file.

Fields on Window “Map printing”

Layout	
Layout template	Existing layout files in the EriMap configuration directory. A0, A1, A2, A3 and A4 templates are provided at installation.
Edit	Enabled only if the selected layout can be written to. Invokes the layout editor window.
New	Invokes the layout editor window with selected file as template layout.
Text contents	
Title	The title of the output printed at the top of the window just below the logotype in bold font
Comments	Any number of lines of additional information
Custom scale	The map scale factor to use for the printout. The print scale will be reset to the original map scale the next time you open this window.
Logo	An image file containing a logotype.
Text options - Select desired text options to rule which text contents to display	
Logo	Enables printout of the logotype
Title	Enables printout of the title
Comments	Enables printout of the comments
Legend	Enables printout of the map legend. The legend must be visible in the map display to be included in the printout.
Coordinates	Enables printout of the coordinates for lower-left and upper-right corner of the map in current coordinate system, for example lola or xy.
Projection	Enables printout of the map projection in the coordinate system.
Scale	Enables printout of the custom scale.
Ruler	Enables printout of the graphical relationship between the map metrics and the real world.
Custom/Project	Enables printout of the project name.
Date	Enables printout of date and time at the printout.
Printing options	
Print quality	Sets the printing quality to high (default), medium or low
Print to file	Enables printout of the map and text to the file entered in the field under this option.

Print setup...	Opens the **Print** window where you select printer and printing properties. Maps can be printed in landscape or portrait mode. ***Note:*** *Note that if the default printer values are not supported by the selected printer, you must set the printer's orientation and paper size in the* ***Print*** *window. These settings must also be entered in the* ***Page setup*** *window to take effect.*
Print	Starts printing. The window is closed when the printing completes.

Edit Map Printing Layout

Use this procedure to edit the layout of map printout.

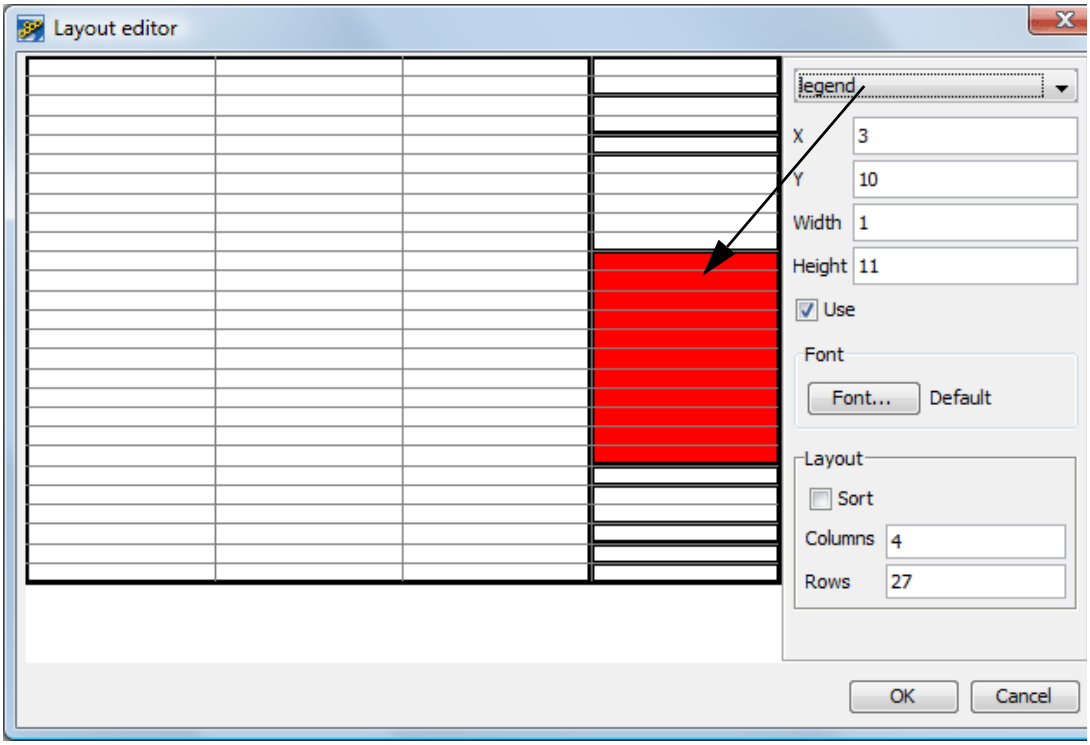
Prerequisites

The Map printing window is opened, see Print Map.

Procedure

Follow these steps to edit the layout of printed maps:

1. In the **Map printing** window, click **New**, or select a layout template and click **Edit**. The **Layout editor** window appears as in the following example:



The right side of the window displays the layout parameters with the currently edited field in the upper right corner. The left side of the window displays a graphical "preview" of the layout, with the currently edited field highlighted in red color.

2. When you click in a rectangle in the "preview", the rectangle is highlighted, and the corresponding layout parameters appear to the right.
3. To resize any rectangle, indicate the area in the "preview" grid, hold down the right mouse button and drag the cursor. Alternatively you can modify the **width** and **height** parameters to the right.
4. To move any rectangle, indicate the area in the "preview" grid, hold down the left mouse button and drag the cursor. Alternatively you can modify the **X** and **Y** offset parameters to the right.
5. You can undo (CTRL+Z) or redo (SHFT+CTRL+Z) changes.

Fields on Window "Layout editor"

"Preview" of the layout	When you click in a rectangle the corresponding layout field is selected and the rectangle highlighted.
X (mm)	Horizontal grid coordinate for upper left corner of the layout field.

Y (mm)	Vertical grid coordinate for upper left corner of the layout field
Width (mm)	Grid width (horizontal) of the layout field.
Height (mm)	Grid height (vertical) of the layout field.
Use	Indicates that the field should be used in the layout.
Font	Font used for the field. If the field is clicked, the font chooser window is displayed so can change the font.
Sort	Rearranges display to fit print area when the selected field is changed.
Columns	Grid width, number of columns in grid, must be more than 1.
Rows	Grid length, Number of rows in the grid, must be more than 1.

10
Filters

This chapter describes how to view and analyze a limited number of explorer objects by using filters.

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About Filters

Filters allow you to limit the number of displayed sites or RBSs, or the number of analyzed cells, in an open project.

You can use filters in the following ways:

- Use Filters in the Map Display
- Use Filters in Explorers or Analysis Windows
- Use Selection of Sites from Map in Explorers or Analysis Windows
- Use Filters Together with a Working Area

You can define filters for areas, sites or cells, with certain attribute (parameter) values, flag values (user-defined custom attributes), or belonging to a certain radio technology and category (GSM, LTE, LTE RBSs, LTE fixed subscribers, WCDMA, WiMAX, WiMAX RBSs, WiMAX fixed subscribers). Selecting LTE or WiMAX includes both RBSs and fixed subscribers. Filters can also be combined in *group filters*.

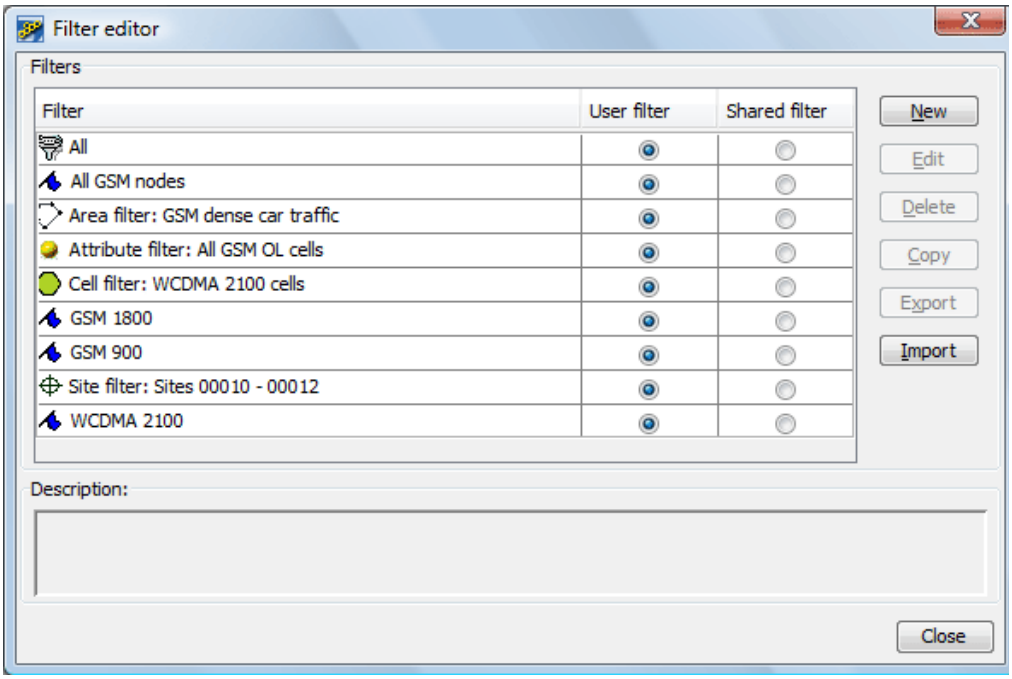
You can Edit Logical Expressions to combine areas / attributes / filters as logical expressions in area filters / attribute filters / group filters, respectively.

Defined filters, but not information on currently applied filters, are saved with the project. This means that whenever you open a project you can select from a list of previously defined filters, but the project is initially unfiltered even if you applied a filter before saving the project. You may though Apply a Working Area to "filter" a project already when opening it.

Each filter is defined either for all users in a project (*shared filter),* or for the current project user only (*user filter)*.

The Filter Editor

You define filters in the Filter editor opened from **Utilities↗Filter editor as in the following example**:



Fields on Window "Filter editor"

Filter	List of filters defined in the current TEMS CellPlanner project
User filter	Indicates that the filter can be used by the current user only
Shared filter	Indicates that the filter can be used by anyone with access to the current project
New	Displays the Edit filter window so you can create a new filter
Edit	Allows you to edit the selected/highlighted filter
Delete	Deletes one or more filters from the list
Copy	Copies the selected/highlighted filter so you can rename it and save it with different properties
Export	Exports one or more filters to a file in XML, Excel or text format
Import	Imports one or more filters from an XML, Excel or text file

The Edit Filter Window

The **Edit filter** window is opened in the following cases:

- by selecting **New** or **Edit** in The Filter Editor, or
- by selecting **Create** in the Selection & Filters panel
- by selecting **Edit** in the Selection & Filters panel with **Filter** enabled

The contents vary with the filter type. Differences are outlined in each procedure describing how to define a certain filter. In this section you find the common operations used in the Edit filter window.

You can move between filter types by using the radio buttons in the **Edit filter** window. When you apply a filter, you also apply the settings of other filters belonging to other filter types. *Example*: You modify the settings of a site filter and then select the group filter option to create a group filter. When you click Apply, the new group filter and the modified site filter are both applied.

Enter Name and Description

You must enter a name for the filter. The name shall consist of maximum 128 alphabetical or numerical characters. Do not use /,\,' or %.

Optionally enter a description in free text.

Include and Exclude Objects in the Filter

Do as follows to move objects between the **Available** and **Included** lists:

- To include an object in the filter, select it in the **Available** list and move it to the **Included** list by drag and drop, by right-click and select **Add node**, or by CTRL-d.
- To delete an object from the filter, select it in the **Included** list and move it to the **Available** list by drag and drop, by right-click and select **Remove**, or by CTRL-r.

Some filters support moving with arrows:

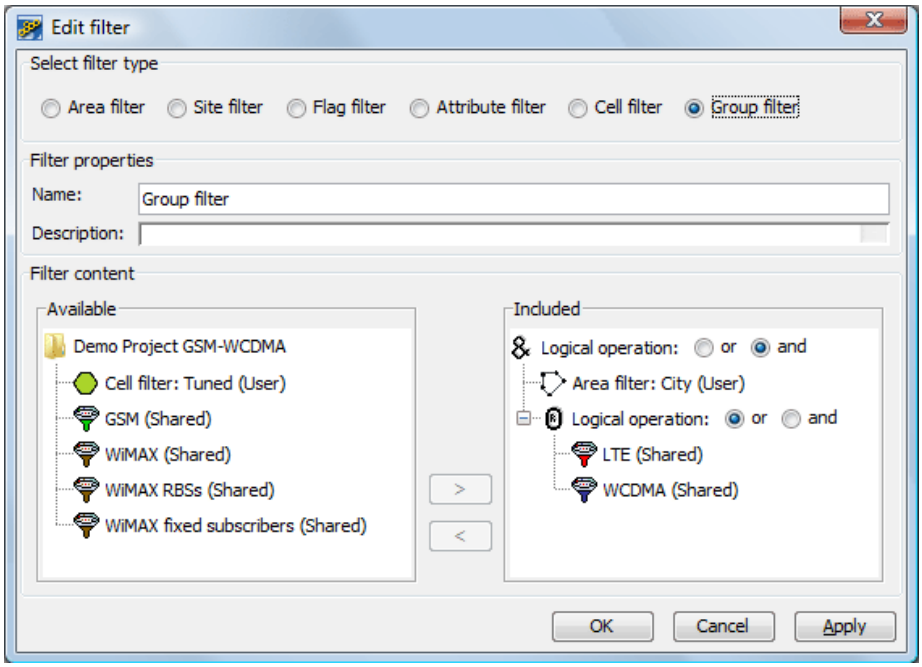
- To include an object in the filter, select it in the **Available** list and click the right arrow >. To include all objects in the filter, select it in the **Available** list and click the double right arrow >>.
- To delete an object from the filter, select it in the **Included** list and click the left arrow <. To delete all objects from the filter, select it in the **Included** list and click the double left arrow <<.

Edit Logical Expression

Logical expressions allows you combine conditions by **or/and** operations. You can edit logical expressions to combine areas / attributes / filters as logical expressions in area filters / attribute filters / group filters, respectively.

The figure below exemplifies a group filter that will pass LTE and WCDMA objects in the City area according to the logical expression:

(area filter = City AND ((group filter = LTE) OR (group filter = WCDMA))



To add a sub-operation under an existing logical operation, select the logical operation, right-click and select **Add or node** or **Add and node**.

Note: *Until you have placed operands under the logical operation it is just an empty "container" operation showing options "block" and "pass".*

To move operands or logical operations in the Included panel, use drag and drop, right-click followed by **Move** and **Paste**, or CTRL-x followed by CTRL-v.

To remove operands or logical operations, use right-clock followed by **Remove**, or CTRL-r.

For attribute filter only: To copy attributes or logical operations, use CTRL + drag and drop, right-clock followed by **Copy** and **Paste**, or CTRL-c followed by CTRL-v.

Tip: First move all operands to the **Included** list, then create the number of logical operations needed, and finally place the operands under the appropriate logical operation.

Defining Filters

Before using filters you must create them from The Filter Editor and define them in The Edit Filter Window. You can define filters for area, site, flag, attribute and cell. You can also define group filters, combining other filters.

Define Area Filter

Area filters are used to geographically limit the number of sites to display and include in filtered analysis calculations.

Filters can, like areas, be shared or valid for the current project user only.

The following rules apply to area filters:

- User filters can include user areas and shared areas
- Shared filters can include shared areas only
- Shared filters can be converted to user filters
- User filters with shared areas only can be converted to shared filters
- Areas deleted from the server are removed from filters including the area

Prerequisite

The area to include in the filter is defined, see Define Map Area on page 9-36.

Procedure

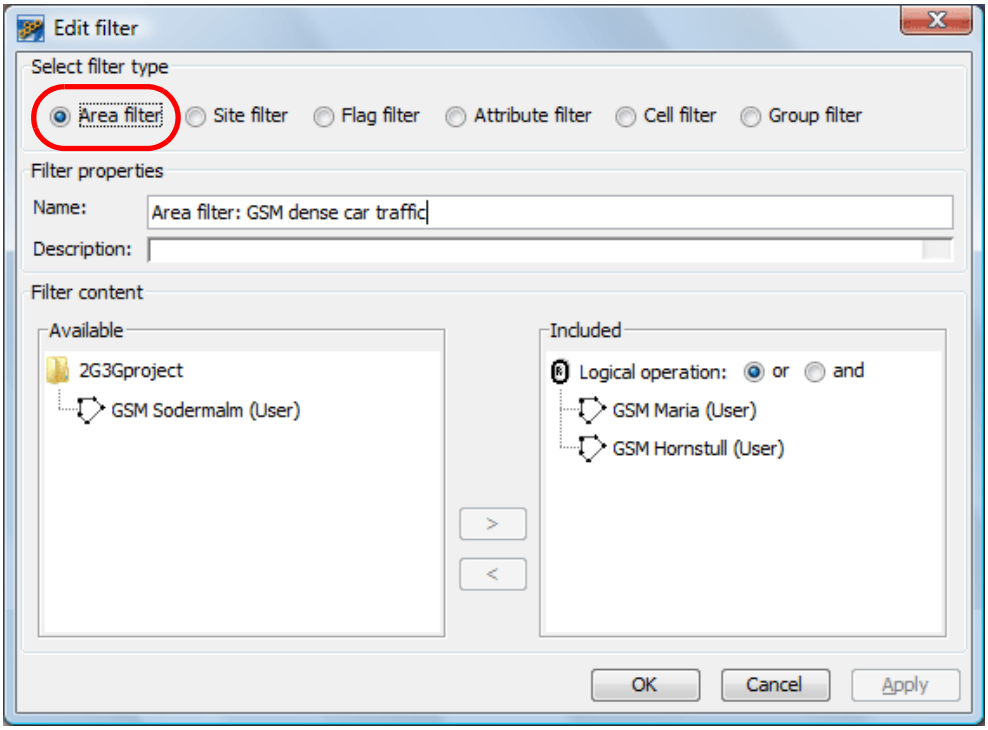
Follow these steps to define an area filter:

1. Select **Utilities↗Filter editor**. The Filter Editor window appears.
2. Click **New to** display The Edit Filter Window.
3. Enter Name and Description for the filter.
4. In the **Select filter type** field, select **Area filter**. The window is updated with available areas, and an initial logical operation.

   Note: *Until you have placed operands under the logical operation it is just an empty "container" operation showing options "block" and "pass".*

5. Include and Exclude Objects in the Filter.

6. Edit Logical Expression to combine areas, as in the following example:



7. Click **Apply** to create the area filter. The filter appears in the **Filter editor** window.

Define Site Filter

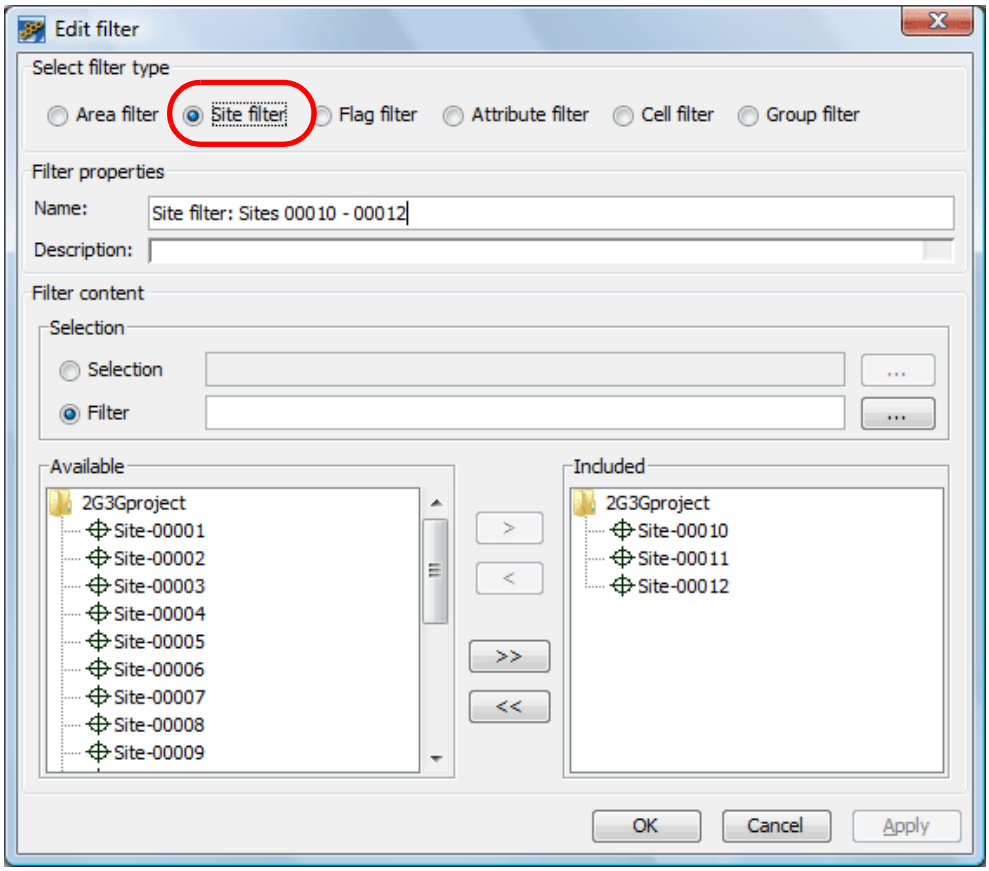
A site filter excludes sites not included in the filter.

Procedure

Follow these steps to define a site filter:

1. Select **Utilities↗Filter editor**. The Filter Editor window appears
2. Click **New to** display The Edit Filter Window.
3. Enter Name and Description for the filter.
4. Optionally limit the number of sites possible to select for the filter, see Create Filter from Explorers or Analysis Windows on page 10-16.
5. In the **Select filter type** field, select **Site filter**. The window is updated with the available sites.

6. In the **Filter content** field, select or filter out the sites from which to select sites for the site filter.
7. Include and Exclude Objects in the Filter as in the following example:



8. Click **Apply** to create the filter. The filter appears in the **Filter editor** window.

Define Flag Filter

Use this procedure to create a filter with flag types from the **System explorer**.

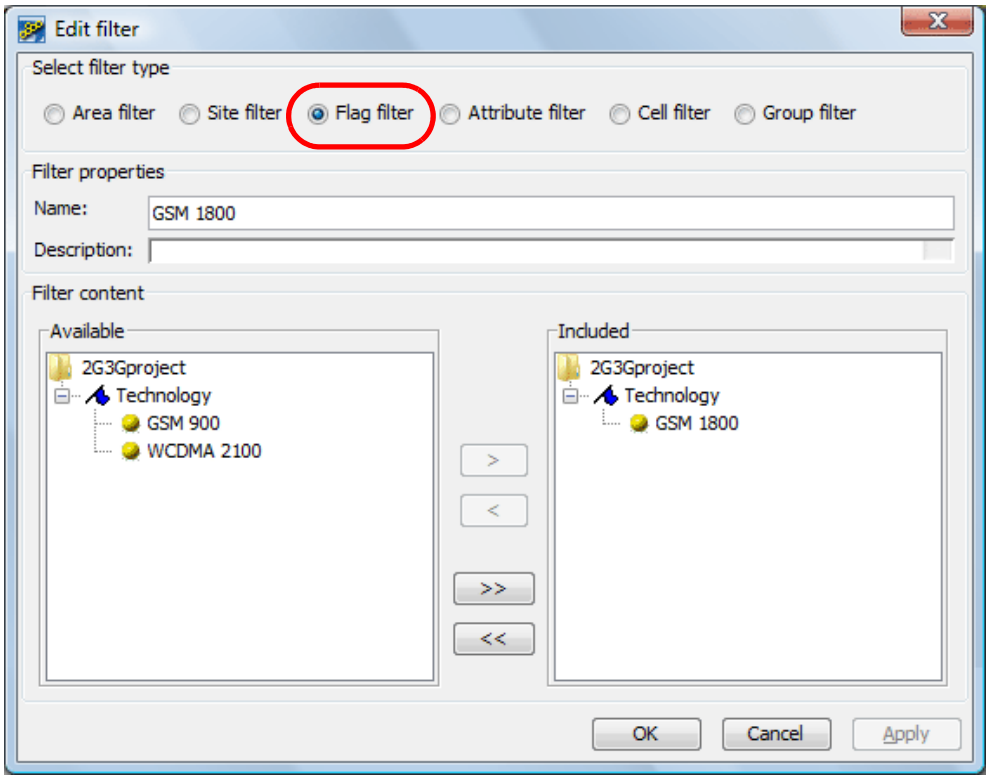
Only the objects (sites, RBSs, cells, antennas and so on) with flag types and flag values matching the filter criteria are shown on the map display and included in filtered analysis calculations.

Procedure

Follow these steps to create a flag filter:

1. Select **Utilities↗Filter editor**. The Filter Editor window appears.

2. Click **New to** display The Edit Filter Window.
3. Enter Name and Description for the filter.
4. In the **Select filter type** field, select **Flag filter**. The window displays the available flags.
5. Include and Exclude Objects in the Filter as in the following example:



6. Click **Apply** to create the flag filter. The filter appears in the **Filter editor** window.

Define Attribute Filter

Use this procedure to define filters for parameters and custom attributes.

Only the objects (sites, RBSs, cells, antennas and so on) with parameters and/or custom attributes matching the filter criteria are shown on the map display and included in filtered analysis calculations.

Procedure

Follow these steps to create an attribute filter:

1. Select **Utilities↗Filter editor**. The Filter Editor window appears.
2. Click **New to** display The Edit Filter Window.
3. Enter Name and Description for the filter.
4. In the **Select filter type** field, select **Attribute filter**. The window is updated with available attributes and an empty logical operation.

   Note: *Until you have placed operands under the logical operation it is just an empty "container" operation showing options "block" and "pass".*

5. In the **Filter type** field, select the granularity of the filter.
6. Include and Exclude Objects in the Filter.
7. Set operators and values for each **Included** attribute.
8. Edit Logical Expression to combine attributes.

   The result might look as in

   - Example: Attribute Filter with GSM OL Attributes on page 10-12 or
   - Example: Attribute Filter with Position Attributes on page 10-13.

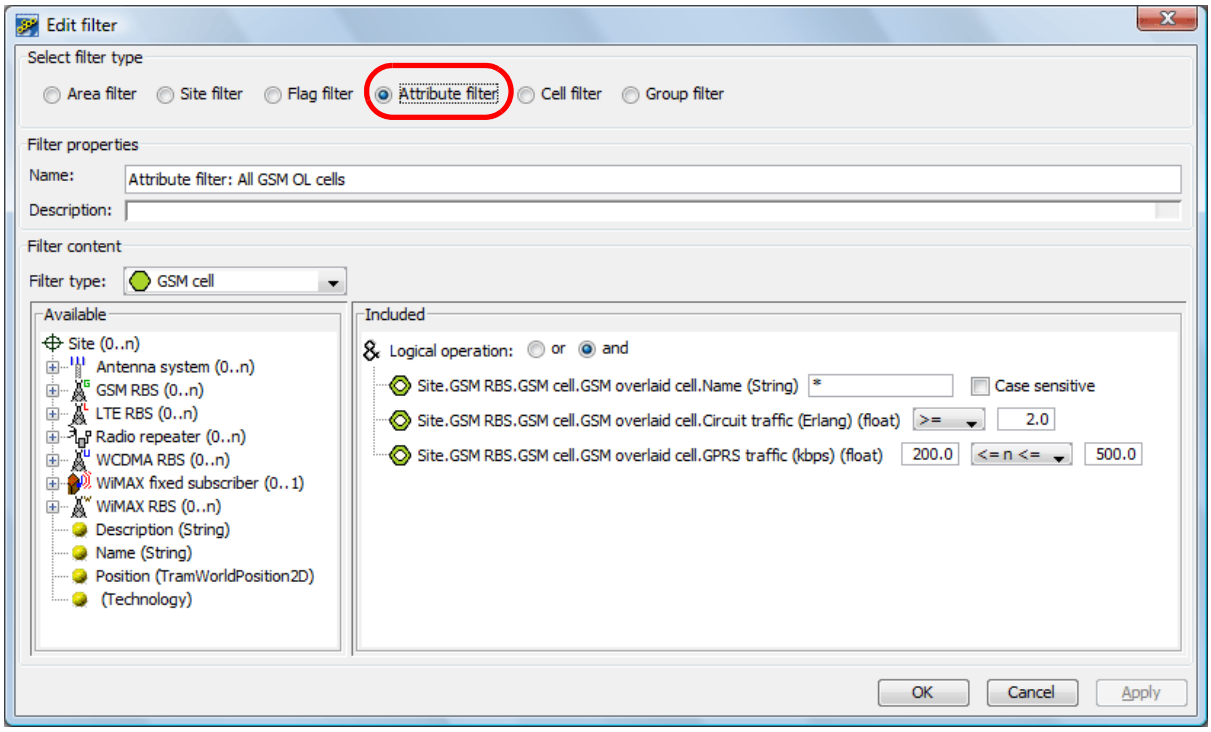
9. Click **Apply** to create the attribute filter. The filter appears in the **Filter editor** window.

Fields on Window “Edit filter - Attribute filter”

Filter type	Granularity of the filtering. Examples: • To include all **sites** with a cell name ending with “A1”, select “Site” as filter type and include the condition `<UTRAN cell name> = *A1` • To include all UTRAN **cells** with a name ending with “A1”, select “UTRAN cell” as filter type and include the same condition as above The difference is obvious when using the filter in the site explorer or in the map display.
Available	List of attributes - parameters and custom attributes - possible to select for an attribute filter. The selectable attributes are the leafs in the tree structure of objects.
Included	List of attributes selected for the attribute filter, and the logical operations **or/and** applied on the objects. Each selected attribute automatically gets a condition appended. The condition depends on the type of object. Examples: • A string attribute gets an empty field appended, allowing you to include only objects with a name matching the criteria you enter. Example: Site.Name with value *City* will only display sites including the word City. A question mark (?) substitutes one character. An asterisk (*) substitutes one or more characters. **Case sensitive** matching can be selected by using the option after the string. • An integer attribute gets a comparison operator field (=, <=, >=) followed by a field where you enter a value to compare with. Example: A condition like “DL bit rate <= 2048 kbps” includes cells (or sites, depending on the granularity in the filter type) with maximum 2 Mbps DL bit rate in the filter. You can also define an interval by selecting an interval operator (<= n <=) surrounded by lower and upper limits. You can also define a list of values after operator (=). Example: “DL bit rate” = 20,50,100. • A position attribute filter can filter either on area or on position. With **Search area** selected, you select an area filter and **Inside** or **Outside**. With **Search position** selected you define a circular search area by clicking **Get position** followed by click and drag on the map display, or by entering the coordinates and radius manually. See Example: Attribute Filter with Position Attributes.
Apply	Creates the attribute filter.

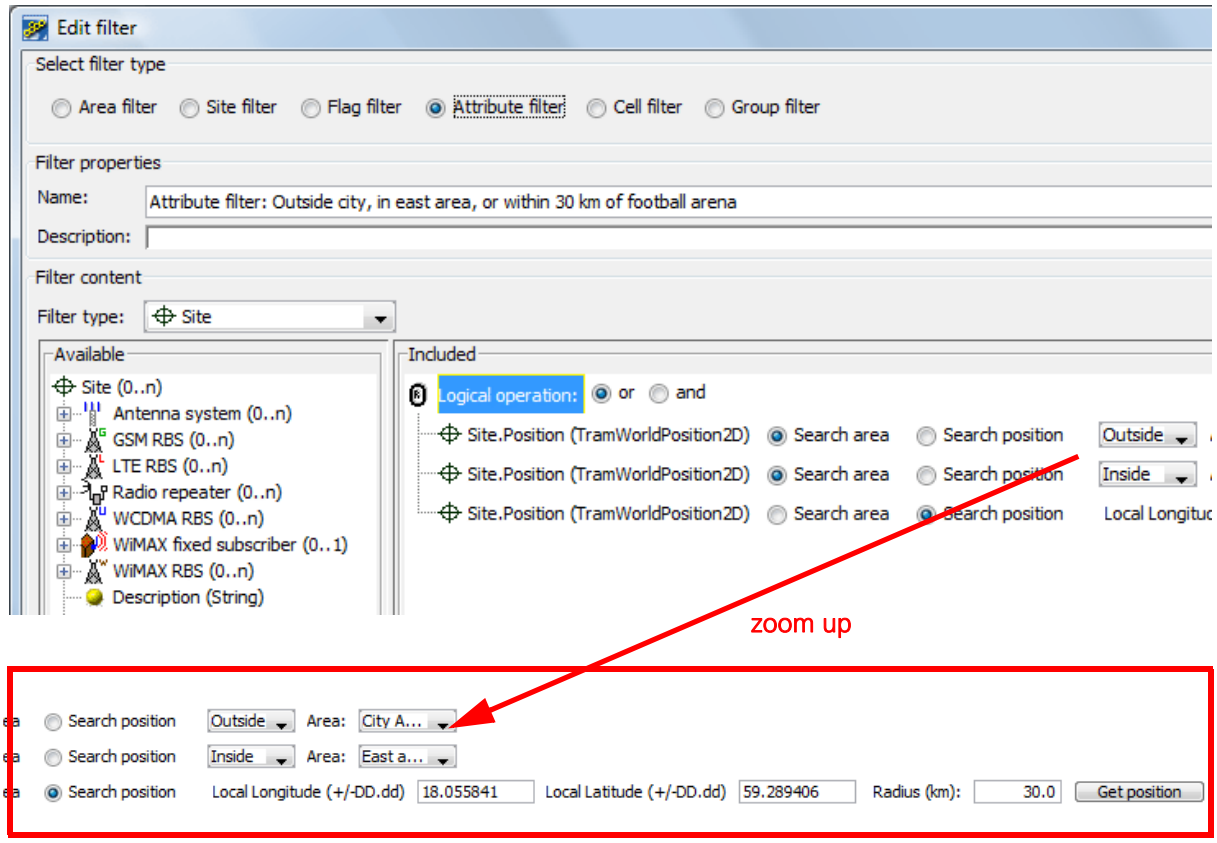
Example: Attribute Filter with GSM OL Attributes

Objects with the GSM OL attribute settings below will pass the filter:



Example: Attribute Filter with Position Attributes

Objects outside City Area, or in the East Area, or within 30 km from the position of a sports arena specified by its position will pass this filter:



Define Cell Filter

The cell filter allows you to define a filter including cells of selected cell types: GSM and/or WCDMA and/or LTE and/or WiMAX cells.

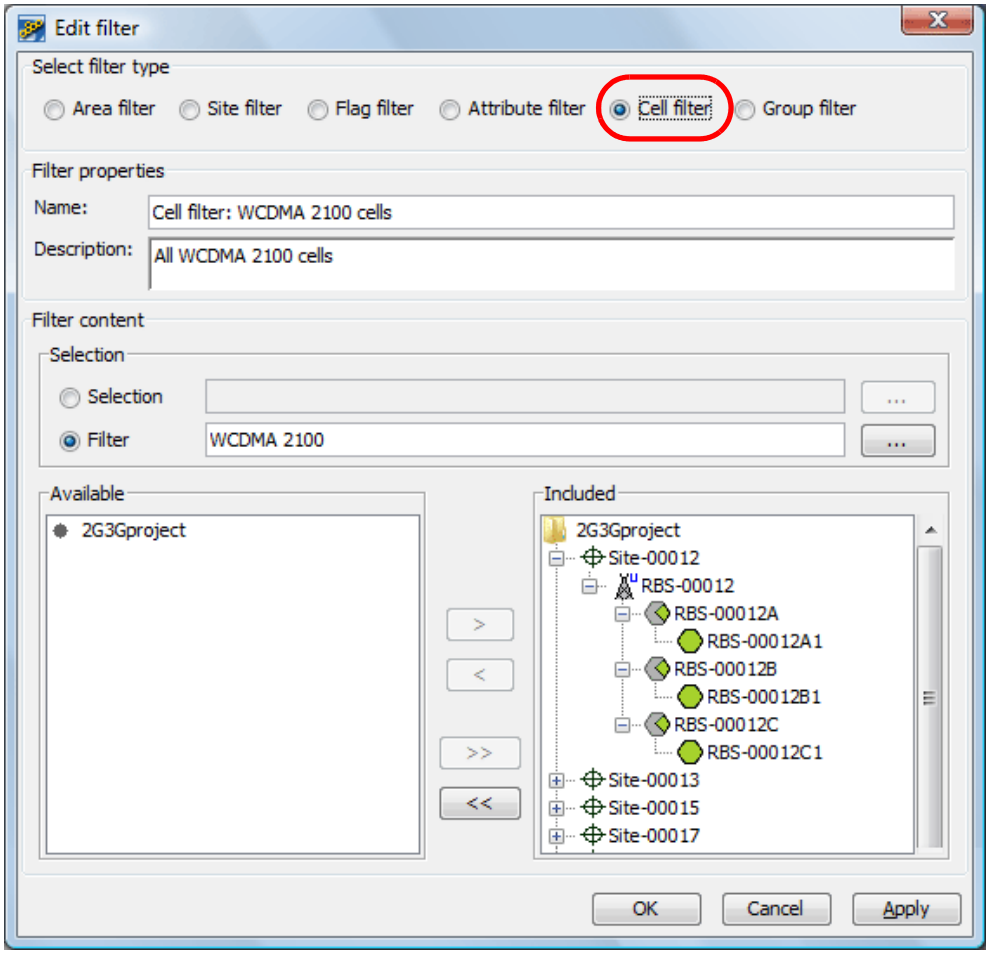
Only the cells included are shown on the map display and included in filtered analysis calculations.

Procedure

Follow these steps to create a cell filter:

1. Select **Utilities↗Filter editor**. The Filter Editor window appears.
2. Click **New to** display The Edit Filter Window.
3. Enter Name and Description for the filter.

4. Optionally limit the number of cells possible to select for the filter, see Create Filter from Explorers or Analysis Windows on page 10-16.
5. In the **Select filter type** field, select **Cell filter**. The window is updated with available cells.
6. In the **Filter content** field, select or filter out the cells from which to select cells for the cell filter.
7. Include and Exclude Objects in the Filter as in the following example:



8. Click **Apply** to create the cell filter. The filter appears in the **Filter editor** window.

Define Group Filter

A group filter (or filter group) is a combination of a number of filters.

Shared group filters can only include shared filters, not user filters.

Predefined, non-editable, group filters are provided for LTE, WCDMA, GSM, WiMAX, and for WiMAX fixed subscribers.

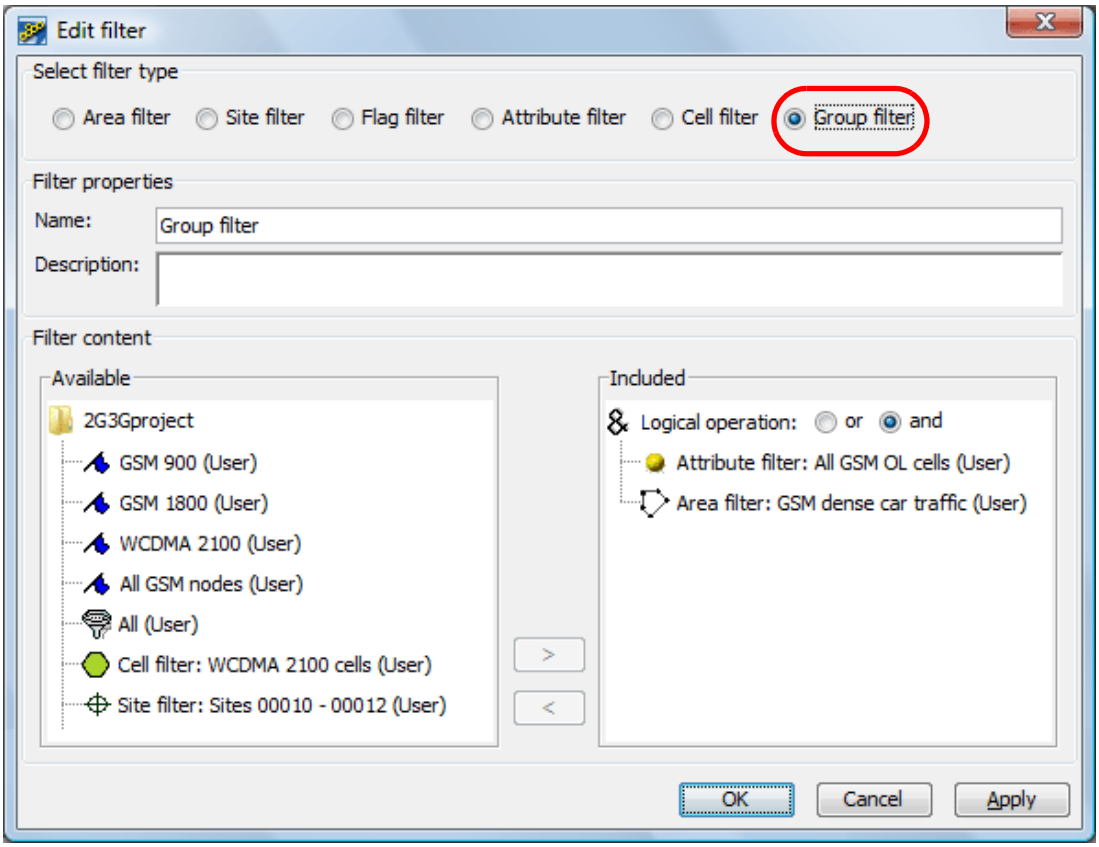
Procedure

Follow these steps to create a group filter:

1. Select **Utilities↗Filter editor**. The Filter Editor window appears.
2. Click **New to** display The Edit Filter Window.
3. Enter Name and Description for the filter.
4. In the **Select filter type** field, select **Group filter**. The window displays the available filters, and an empty logical operation.

   Note: *Until you have placed operands under the logical operation it is just an empty "container" operation showing options "block" and "pass".*

5. Include and Exclude Objects in the Filter.
6. Edit Logical Expression to combine the filters as in the following example:



7. Click **Apply** to create the group filter, now appearing in the **Filter editor**.

Create Filter from Explorers or Analysis Windows

You can create filters from the Selection & Filters panel in explorers or analysis windows.

Case A: Create Site or Cell Filter from a Selection

1. Choose **Selection** to base the filter on a selection of sites, RBSs or cells.
2. Click **Create to** display The Edit Filter Window.
3. Proceed with Define Site Filter or Define Cell Filter.

Case B: Create Any Filter Type without a Selection

1. Choose option **Filter**.
2. Click **Create to** display The Edit Filter Window.
3. Proceed with Define Area Filter, Define Site Filter, Define Flag Filter, Define Attribute Filter, Define Cell Filter or Define Group Filter.

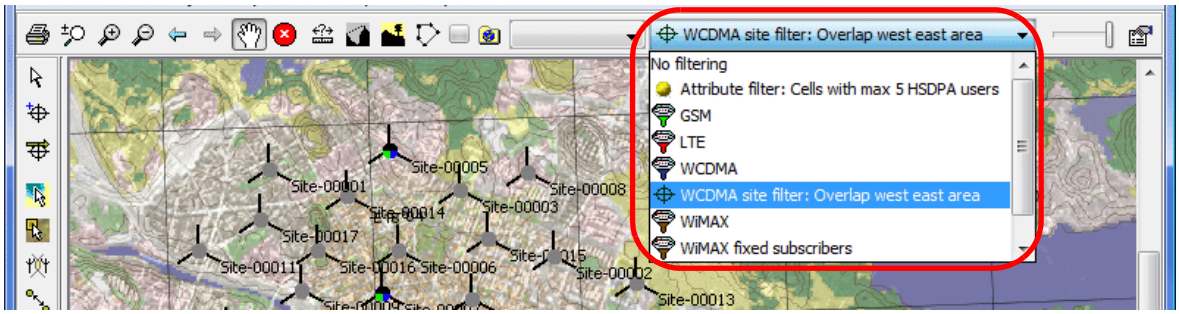
Using Filters

Once you have defined filters you can apply them in explorers, analysis windows or the map display. Note that if you apply a filter in the map display, it does not affect the filtering in explorers or analysis windows, and vice versa.

Radio technology group filters (LTE, WCDMA, and so forth) are defined already at installation, hence you always have a number of available filters.

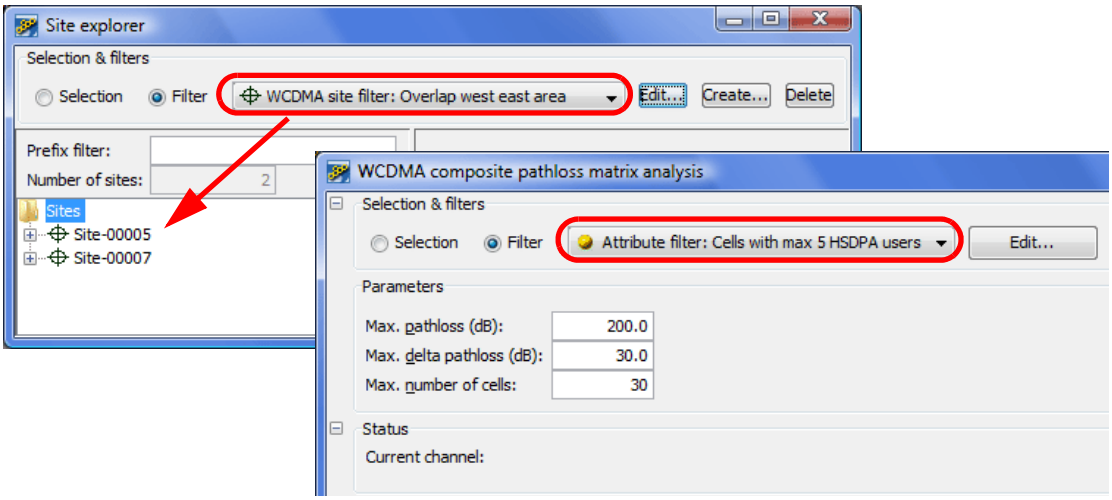
Use Filters in the Map Display

In the map display, select a filter from the list with initial value *No filtering*. Only sites passing the filter appear as usual, other sites are grayed out.



Use Filters in Explorers or Analysis Windows

In explorers or analysis windows, select option **Filter** and a filter from the list. Only objects passing the filter are visible in the explorer or analysis window.

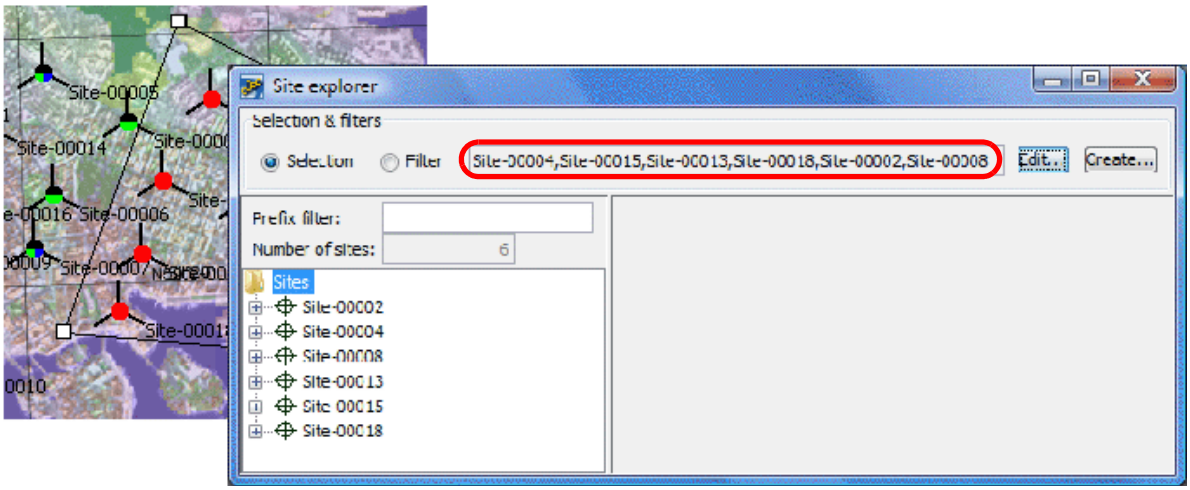


See also The Edit Filter Window on page 10-4 and Use Filters Together with a Working Area on page 10-18.

Use Selection of Sites from Map in Explorers or Analysis Windows

Do as follows to select sites in the map display and use the selection to filter objects in explorers or analysis windows:

1. In the map display, select sites individually, from a polygon or rectangle area, or by clicking on the border of a defined map area. See Select Sites in Map Display on page 2-27 and Define Map Area on page 9-36.
2. Choose option **Selection** in the Selection & Filters panel of the explorer or analysis window. The selected objects (sites, RBSs or cells) or the number of objects are listed right to the selection. Only the objects belonging to the selected sites are listed in the explorer tree as in the example below:



See also Create Filter from Explorers or Analysis Windows on page 10-16 and Remove Selection on page 10-19.

Use Filters Together with a Working Area

You can Apply a Working Area as a rough global selection, and further refine your selection by applying ordinary filters.

As an example, you may be assigned sites 1-20 of a large project. You should first save the project with a working area including these sites only. Each time you open the project, sites 1-20 appear normally in the map display while other sites appear as overview sites, and only sites 1-20 are available in explorers and analysis windows. You then analyze the sites in smaller chunks, for example 1-5, 6-14, and 15-20, by applying selections or any type of filter including the subset of sites.

Deleting Filters and Selections

Delete Filter

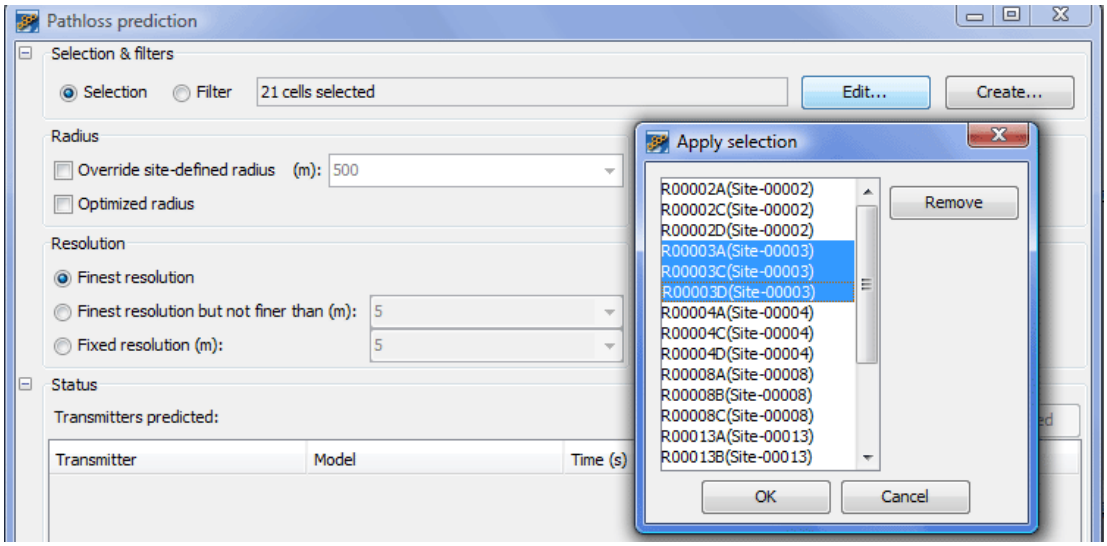
Do as follows to *permanently* delete a filter:

1. Choose option **Filter** and select a filter in the explorer or analysis window.
2. Click **Delete**. You are prompted if you want to permanently remove the filter.
3. Answer **Yes** or **No**.

Remove Selection

Do as follows to remove a selection of sites, RBSs or cells:

1. Choose option **Selection**.
2. Remove sites from the selection by clicking the **Edit** button to the right of the **Selection** field. An additional window is opened.



3. Select the objects to remove and click **Remove** followed by **OK**.
   The removed objects disappear. Note that the objects are not removed from the project, just from the selection.

Reusing Filters

You can reuse filters defined in a project by exporting them to a file of XML, Excel or text format and importing the file into another project.

Chapter *Filter File Format* in the *TEMS CellPlanner Common Features Technical Reference Manual* specifies which file format to use for your needs.

Export Filters

You can export filters of any type to an XML file. You can also export site and cell filters to an Excel spreadsheet file, and site filters to a text file.

Procedure

Follow these steps to export a filter:

1. Select Utilities↗Filter editor. The **Filter editor** window is displayed.
2. Select the filters to export by hightlighting them.
3. Click Export. The Export filter file name window appears.
4. Enter the name of the target file. Use extension .xml, .xls or .txt respectively to export to XML, Excel or text file.
5. Click Save. The selected filter(s) are exported.

Import Filters

You can import filters of any type from an XML file. You can also import site and cell filters to an Excel spreadsheet file, and site filters to a text file.

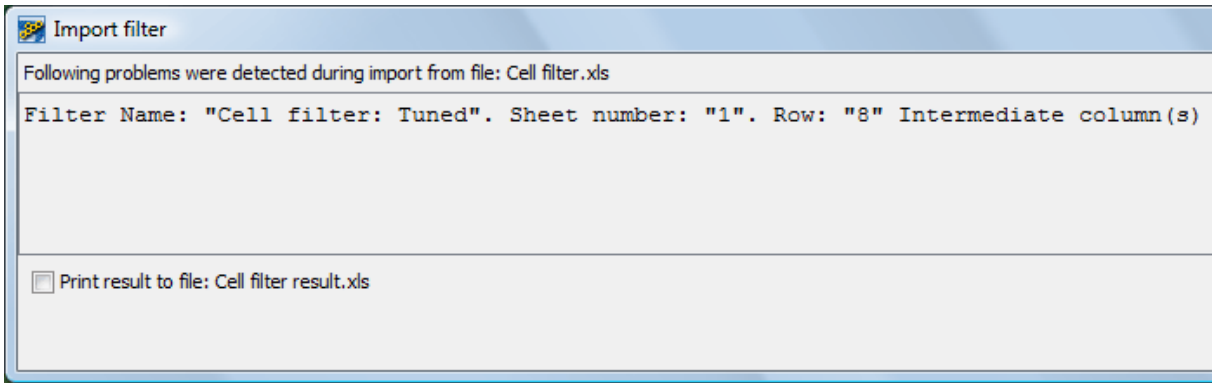
Procedure

Follow these steps to export a filter:

1. Select Utilities↗Filter editor. The **Filter editor** window is displayed.
2. Click Import. The Import filter file name window appears.
3. Enter the name of the file to import and click Open. After successful import, the filter appears in the Filter editor window. In case of any problem with the import, see Examine Reasons for Failed Filter Import on page 10-21.

Examine Reasons for Failed Filter Import

If Import Filters fails, a window like in the following example appears:


Import filter
Following problems were detected during import from file: Cell filter.xls
Filter Name: "Cell filter: Tuned". Sheet number: "1". Row: "8" Intermediate column(s)
Print result to file: Cell filter result.xls

Select option **Print result to file** and click **Close** to create a result file. In this file you find a textual description explaining why the import failed, and missing items are marked with red color.

11
Using Plots

This chapter describes how to display and use plots from analysis results.

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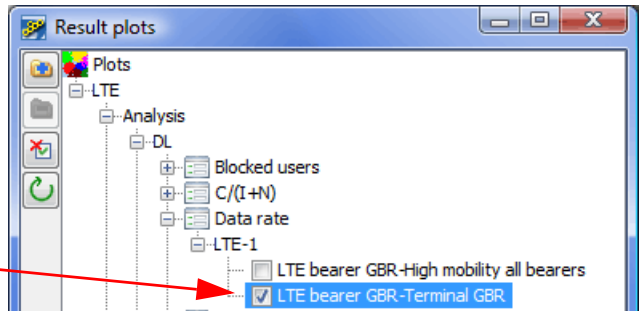
Quick Introduction to Plots

A *plot* shows analysis results as a map layer on the map display. You generate these map layers by selecting plots in the Result plots window, opened from the icon on the vertical toolbar or from menu **Analysis↗Result plots**. Most plots are generated per traffic case (combination of bearer and terminal type) from a traffic demand mix. The traffic cases appear as leaves in the tree structure:

Select one or more plots for immediate display on the map window

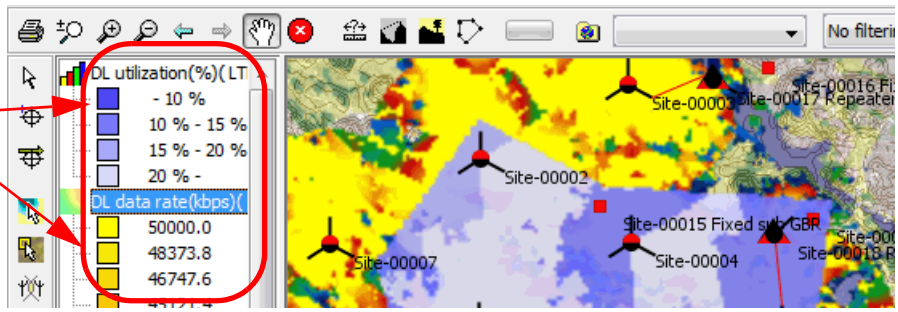
Most plots selected per traffic case



The selected plots are color coded per bin on the map display. The plotted area is limited by a prediction radius per cell, and by area filter settings. Only cells included in the selection or filter for the analysis are included in calculations and plots.

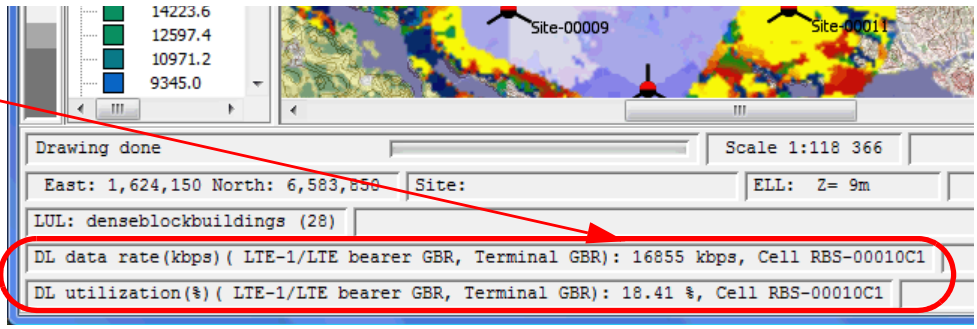
The color coding is listed in the *map legend*: to the left of the map display.

Map legend with color coding per plot



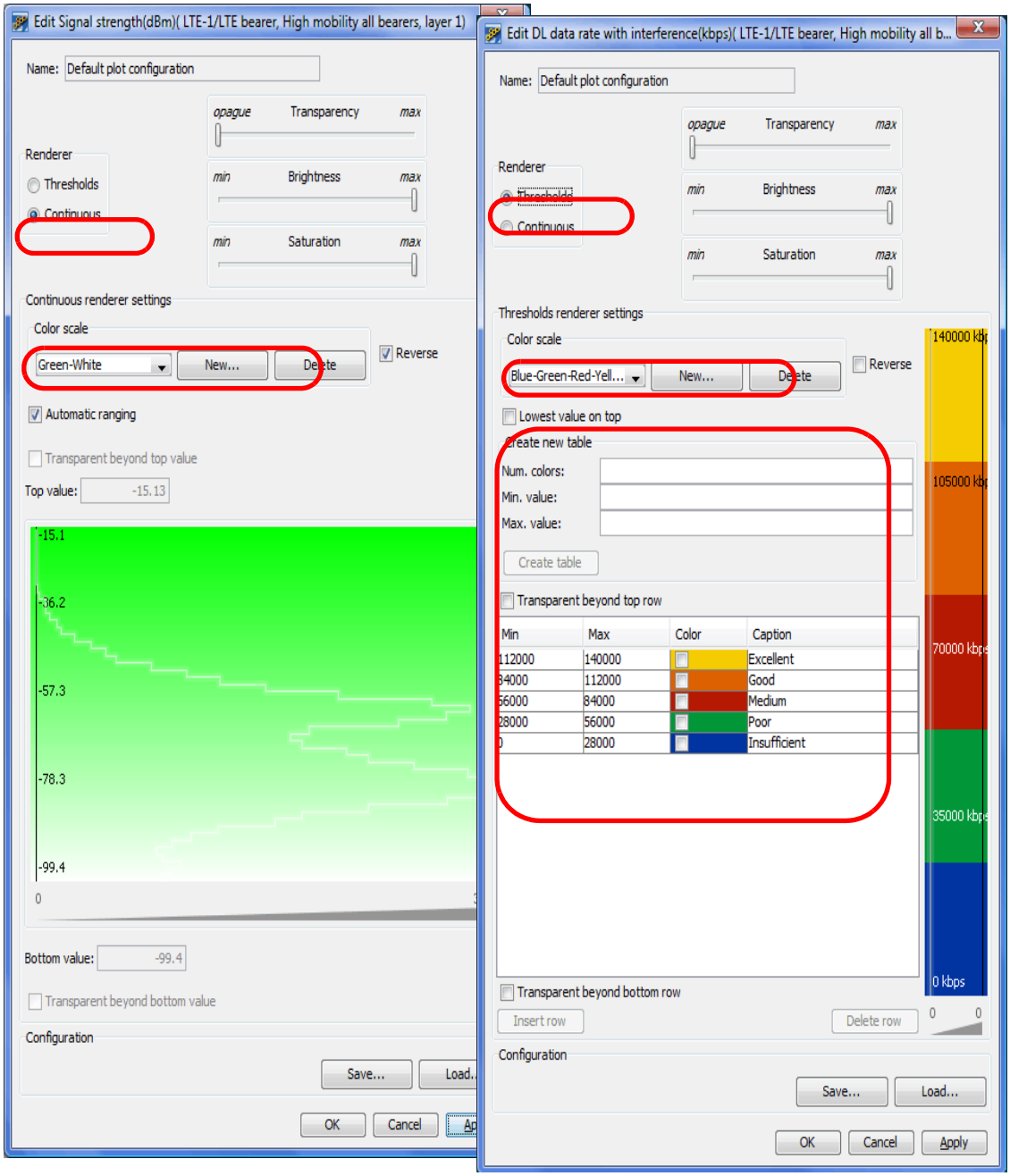
By moving the cursor to any position on the map display, you can read the analysis results of the appointed bin on the *status bar*.

Plotted values are shown on the status bar for the bin where the cursor is placed



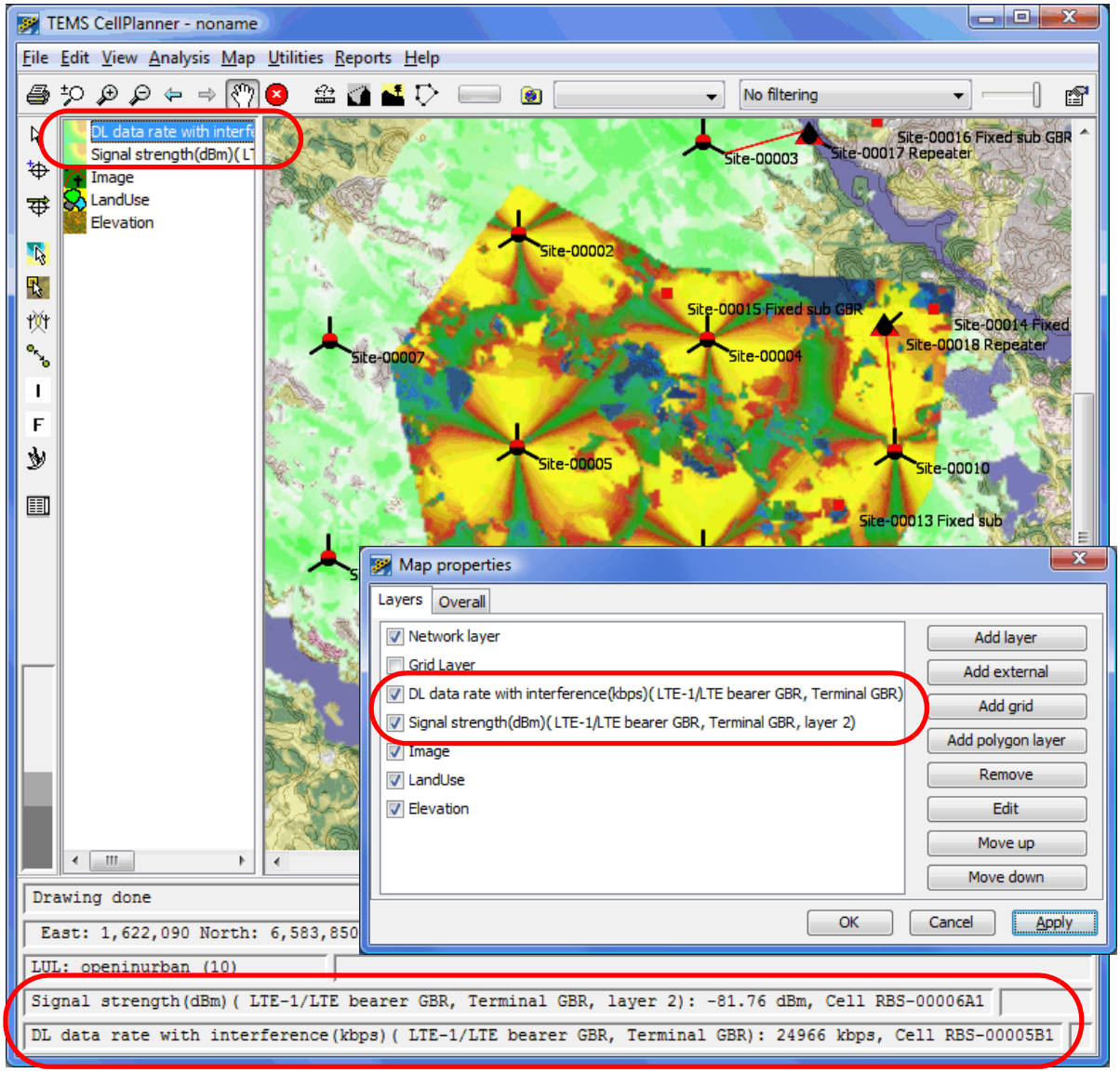
You may select a plot in the map legend or in the Result plots window and edit the *plot configuration* (properties) to select color scale from a large number of available color scales, set transparency, select continuous or threshold based color coding, and so on. In the example below the signal strength plot (to the left) is continuously color coded in green-white colors, while the other plot is color coded in intervals limited by thresholds, in a blue-green-red-yellow color scale.

***Figure 11–1** Plot configurations examples*



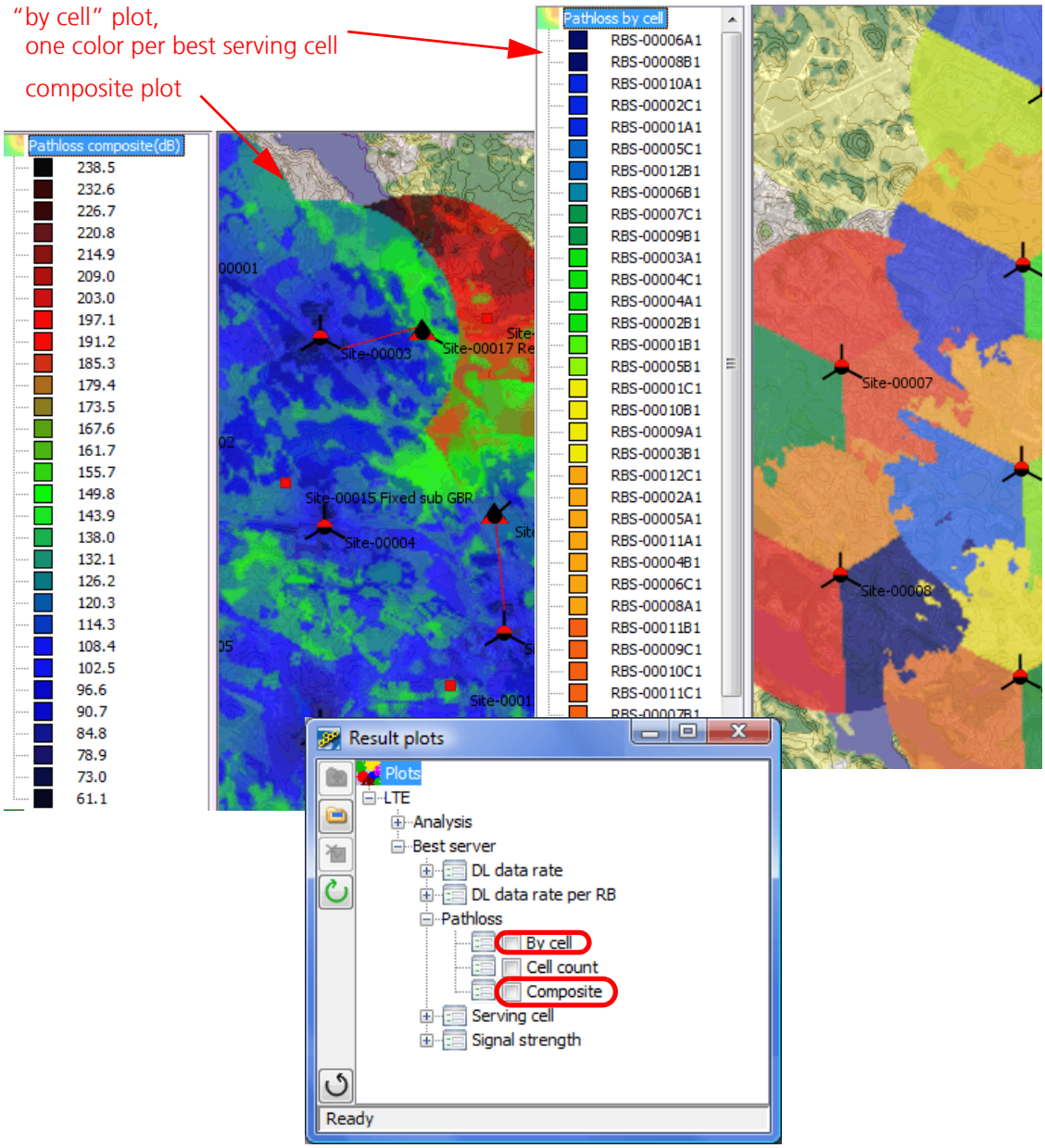
You can also view multiple plots at the same time since plots are displayed as map layers. In the example below you see a green-white signal strength plot under a data rate plot. The data rate plot is limited by a user-defined analysis area, required in the LTE analysis, hence the polygon form. In the example you also see the map properties window where the plot layers appear as any other map layer.

Figure 11–2 Multiple plots displayed simultaneously



"By cell" plots use one color per best serving cell, while composite plots and other plots display one color per value or interval of the analyzed quality.

Figure 11–3 "By cell" plot and composite plot



Read more in Working with Plots, Plot Configurations (Properties), Plot Snapshots and Plot Statistics on how to display, save, compare and print plots, how to edit plot properties, how to save and use snapshots of plots, and how to generate a report with statistics from plots.

Working with Plots

In this section you find descriptions on how to Display Plots, View Color Coding, Compare Plots, Print Plots and Export Plots.

See also how to use Plot Configurations (Properties), Color Scales, Plot Snapshots and Plot Statistics.

Display Plots

Use this procedure to select and view result plots on the map display

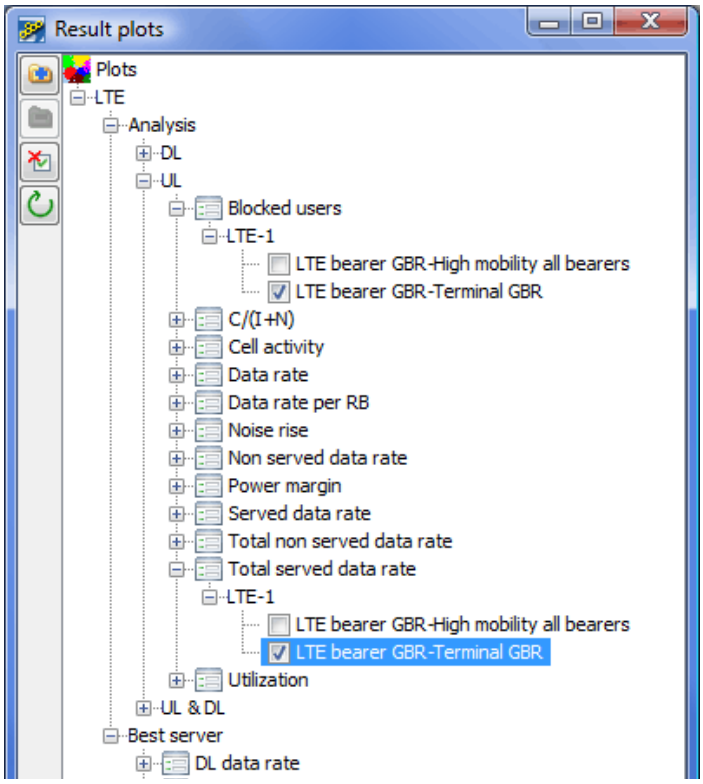
Prerequisites

Calculation results for plots are available from previous analysis runs.

Procedure

Follow these steps to select and view analysis results as plots:

1. Select **Analysis↗Result plots** or click the icon on the vertical toolbar.
   The plots displayed for selection in the **Result plots** window are retrieved from the analysis results of the project.



2. Expand the tree to display the available plots.
3. To select a plot, select the check box next to the plot name or traffic case name. You may select multiple plots and traffic cases at the same time. The selected plot immediately appears on the map display. The plot also appears as a map layer in the **Map↗Display↗Map properties**, and on the status bar and in the map legend.
4. For plots with colors mapped to a dynamic identity, such as "by cell" and "by BSC" plots, you may want to reduce the number of cells (or BSCs) plotted. You accomplish this by selecting the identities to display from the Edit window, see Edit Plot Configuration on page 11-19.

View Color Coding

Use this procedure to view the color coding of displayed plots.

Default color settings with realistic threshold levels are provided for a number of plots. The default color settings are loaded when creating a new project or importing a project. Already existing projects use the existing color settings.

Prerequisites

Plots are shown on the map display, see Display Plots on page 11-6.

Procedure

Do as follows to view the color coding:

1. Select **View↗Legend** or drag the line to the right of the vertical toolbar. The **Legend** panel appears to the left of the map display.
2. To display the color coding of a plot, double-click its top object of the plot in the **Legend** panel. A list of colors with corresponding interval appears under the top object.

See also Edit Plot Configuration on page 11-19.

Compare Plots

Use this procedure to show a comparison between two plots as a color coded delta plot with delta values on the status bar. You may also compare Plot Snapshots.

If the compared plots show values the comparison will show the value difference in a certain position. For example. if the first plot shows 30 dB in a certain position and the second plot shows 20 dB, the comparison will show 10 dB.

If the two plots show identities, for example best serving cell identity, the comparison will show if the identity is equal or different in a certain position.

Comparison plots are transient and can not be saved.

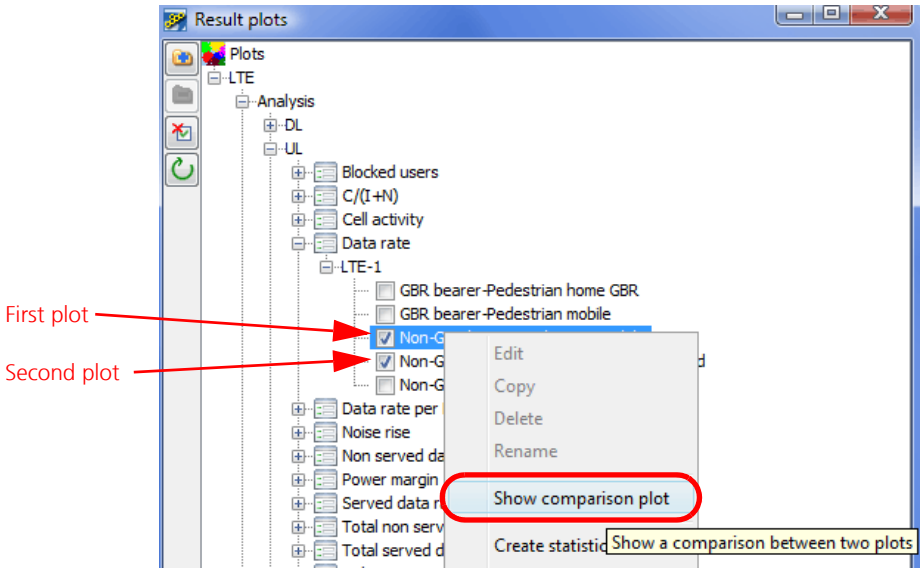
Prerequisites

Calculation results for plots must be available from previous analysis runs.

Procedure

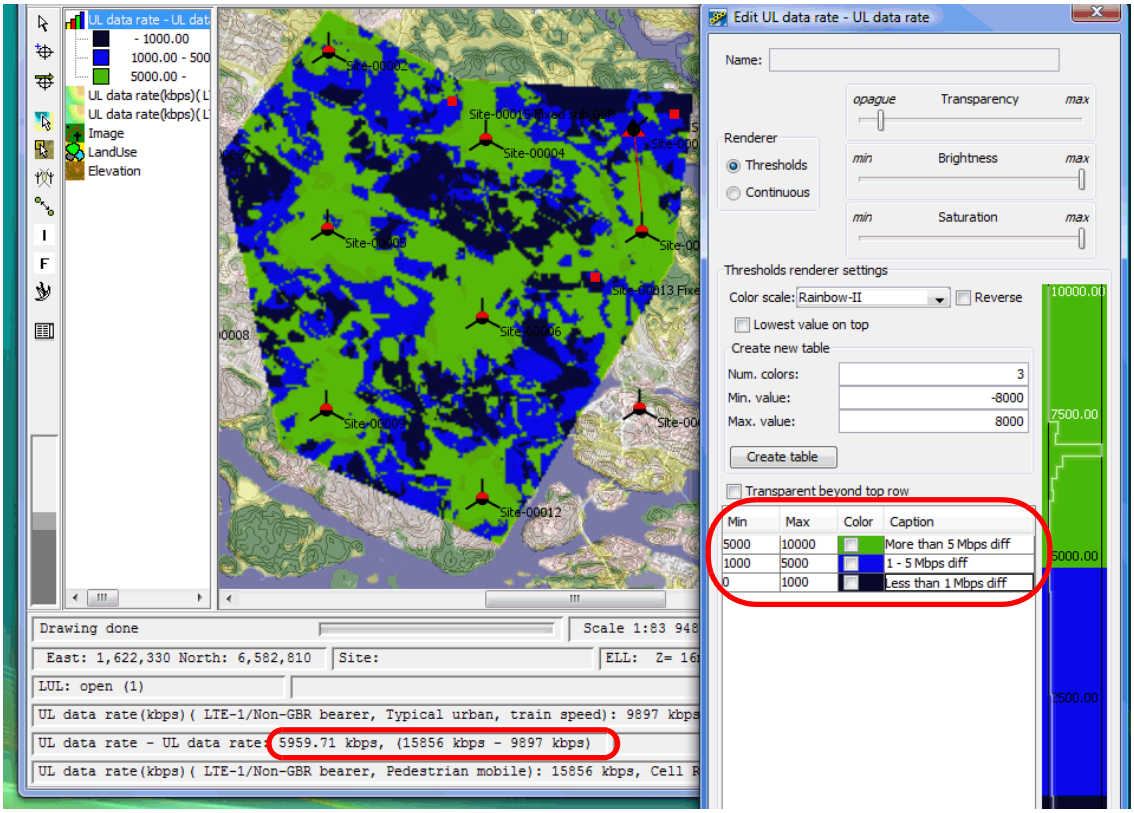
Follow these steps to create a plot snapshot.

1. Select **Analysis↗Result plots** or click the icon on the vertical toolbar.
2. Select the first plot by left clicking in the **Result plots** window.
3. Right-click and select **Show comparison plot**. The example below compares the DL data rate of two similar traffic cases.



4. Move the cursor to the second plot. The cursor takes the form of a green check mark when passing over a comparable plot, otherwise the cursor shows a red cross. Left-click the plot you want to compare with. The delta plot appears on

the map display. The example below shows the DL data rate difference between "Pedestrian mobile" users. and "Typical urban, train speed" users.



Tip: You can move the map layers up or down in the **Map properties** window, for example to place a comparison plot on top of other plots.

Print Plots

You can print plots from the map display. The printout may include the following information:

- Title, network name, calculation result file name, date and time, comments
- Map scale and projection
- Color scales for the plots being displayed
- Columns of site analysis data to help interpreting the data.

For details, see Printing Maps on page 9-40.

Export Plots

You can export plots from the current session. For details, see *Export Map Data* in the *TEMS CellPlanner GeoData User's Guide*.

Plot Configurations (Properties)

A plot is characterized by its properties, such as color coding, transparency, color scale, threshold or continuos color coding. The plot properties are collected in an editable *plot configuration* which determines how the plot is rendered on the map display.

Plot Configuration Types

There are four ways of rendering plots, hence four types of plot configurations classified according to their rendering:

- Quantitative plots for values:
  Continuous Rendering and Thresholds Rendering
- Qualitative plots for identities:
  Dynamic Lookup Rendering and Static Lookup Rendering

You may Edit Plot Configurations to change the display properties, and the properties in the Edit window depend on plot configuration type. Examples and parameter descriptions are provided on subsequent pages.

Continuous Rendering

Continuously rendered plots, for example signal strength or data rate plots, show a unique color code for any value. The **Edit** window of its plot properties might look as in the example below, and the parameters in the **Edit** window are described in Figure 11–4.

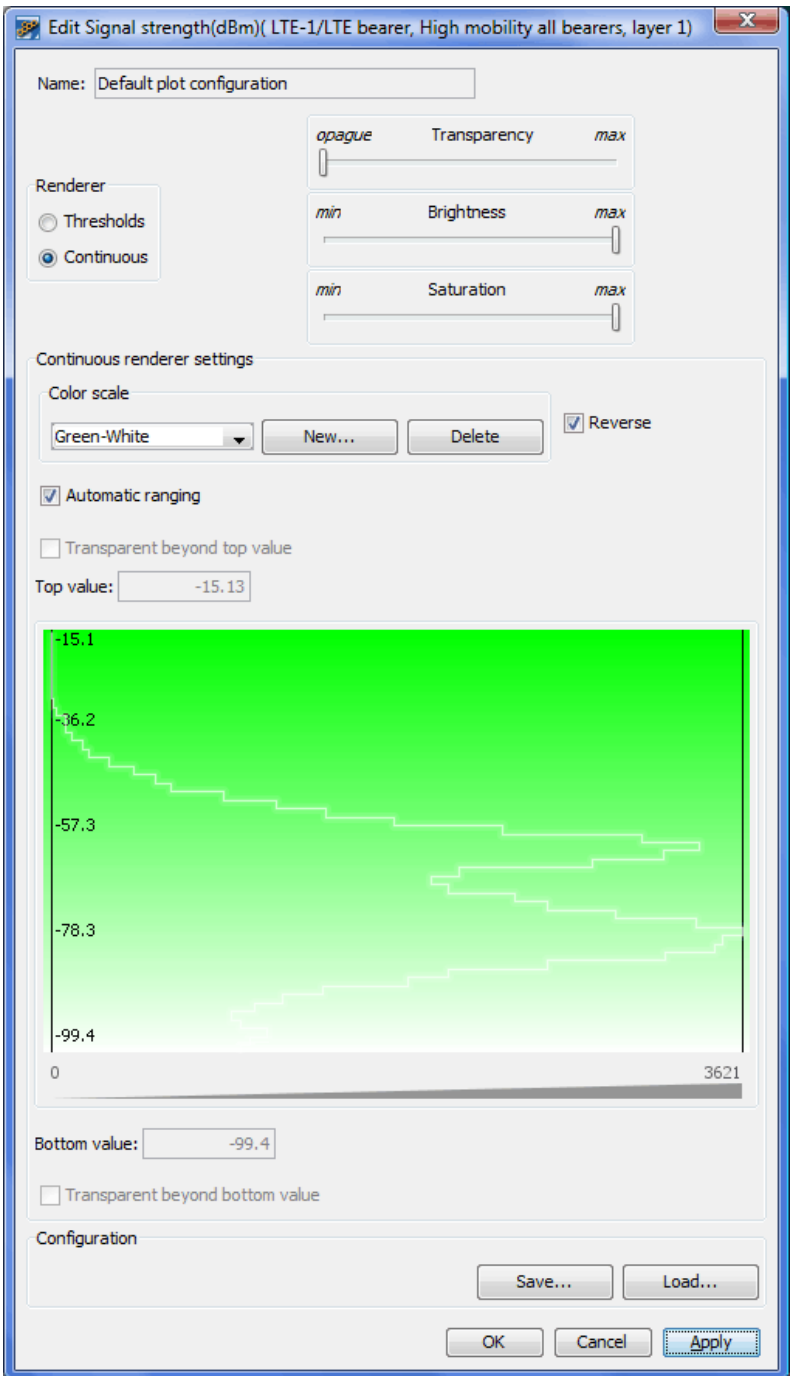


Figure 11–4 Plot properties for Continuous rendering, parameters

Name	Read-only name of the configuration. The XML file with the plot settings is named `<Name>-<plot name>`. Example: `Default plot configuration-lte-analysis-dl-utilization.xml`.
Transparency	Ranging from opaque to max, regulated by slide bar
Brightness	Ranging from min 0 to max 100%, regulated by slide bar
Saturation	Ranging from min 0 to max 100%, regulated by slide bar
Renderer	Color display mode in plot, either of:
("Continuous" selected)	• **Continuous** - suitable to view progression of values over an area, uses more graduated colors • **Thresholds** - suitable to view good and bad service areas, uses fewer contrasting colors
Continuous renderer settings	
Color scale	
Selection from list of available color scales, predefined or your own	
New	Opens the **Color scale tool** to create your own color scale
Delete	Deletes the selected color scale
Reverse	Flips the colors in the color scale upside down
Ranging	
Automatic ranging	Calculates top and bottom value from min and max values in the current plot view
Selectable when **Automatic ranging** is disabled:	• **Transparent beyond top value** - Values above the Top value are invisible in the plot • **Top value** - Value corresponding to the top color in the color scale and legend • **Bottom value** - Value corresponding to the bottom color in the color scale and legend • **Transparent beyond bottom value** - Values below the Bottom value are invisible in the plot
Save	Saves the plot configuration to a file
Load	Loads a plot configuration from file

Thresholds Rendering

Thresholds rendered plots, for example signal strength or data rate plots, show a unique color code for an interval of values, limited by configured thresholds.

The **Edit** window of its plot properties might look as in the example below, and the parameters in the **Edit** window are described in Figure 11–5.

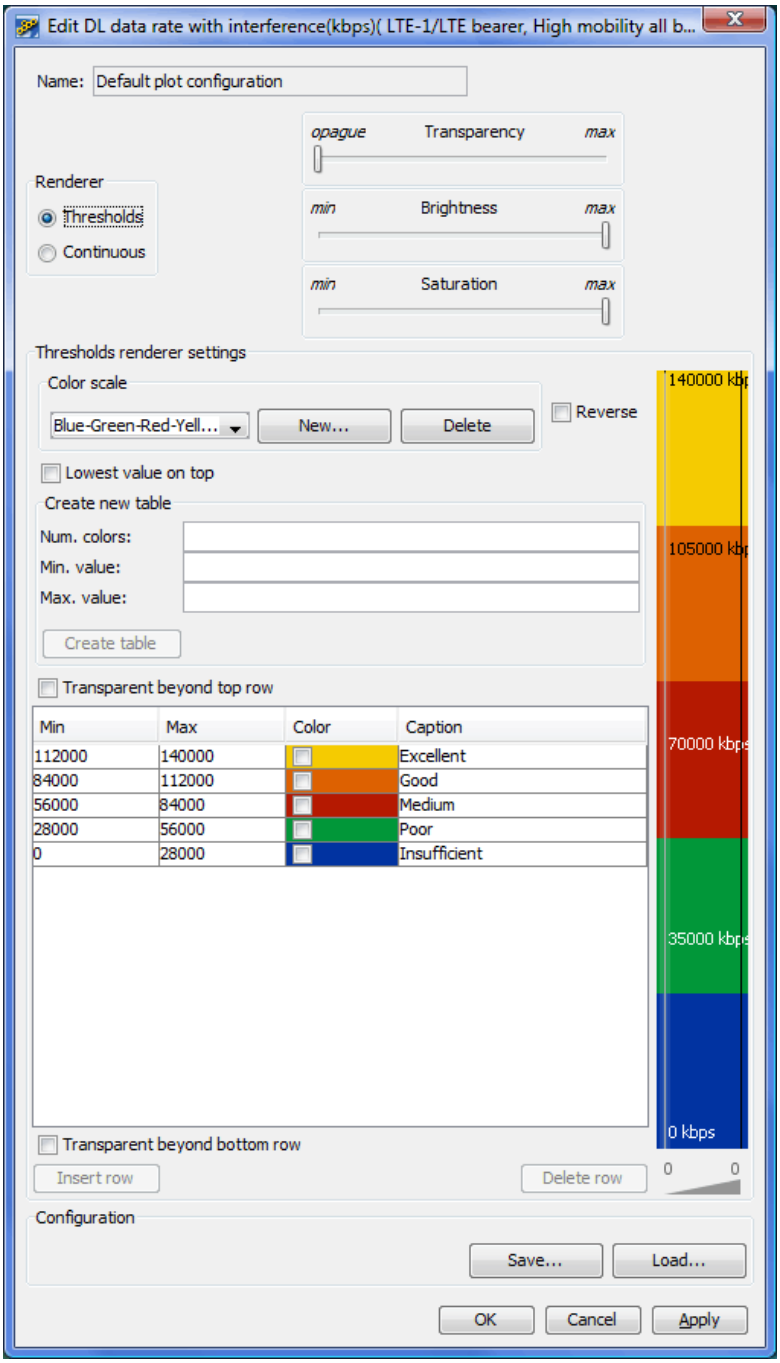


Figure 11–5 Plot properties for Thresholds rendering, parameters

Name	Read-only name of the configuration. The XML file with the plot settings is named `<Name>-<plot name>.xml`. Example: `Default plot configuration-lte-analysis-dl-utilization.xml.`
Transparency	Ranging from opaque to max, regulated by slide bar
Brightness	Ranging from min 0 to max 100%, regulated by slide bar
Saturation	Ranging from min 0 to max 100%, regulated by slide bar
Renderer	Color display mode in plot, either of:
("Thresholds" selected)	• **Continuous** - suitable to view progression of values over an area, uses more graduated colors • **Thresholds** - suitable to view good and bad service areas, uses fewer contrasting colors
	Thresholds renderer settings
Color scale	
Selection from list of available color scales, predefined or your own	
New	Opens the **Color scale tool** to create your own color scale
Delete	Deletes the selected color scale
Lowest value on top	When selected, the lowest value is mapped to the top of the color scale and highest to the bottom, and vice versa
Customized thresholds	
Num. colors	Number of color coded intervals in new threshold table
Min. value	Lowest value in new threshold table
Max. value	Highest value in new threshold table
Create table	Takes the above values as input for a new thresholds table
Thresholds table	
Transparent beyond top row	Values above the max value of the top row in the thresholds table are invisible
Min, Max	Columns with interval limits
Color	Opens window **Override color for thresholds interval** where you can customize the colors
Caption	Optional text identifying the interval
Transparent beyond bottom row	Values below the min value of the bottom row in the thresholds table are invisible
Insert row	Adds row under selected interval in the thresholds table
Delete row	Deletes selected row from the thresholds table
Save	Saves the plot configuration to a file
Load	Loads a plot configuration from file

Dynamic Lookup Rendering

Dynamic identity plots, for example by cell or by BSC plots, show colors mapped to an identity. For the example of by cell plots, each bin is color coded with the color mapped to the best serving cell in the bin. The color coding is preserved when zooming or panning.

Unlike the Static Lookup Rendering, the number of identities to map to colors depend on the amount of identities in the project.

The **Edit** window of its plot properties might look as in the example below, and the parameters in the **Edit** window are described in Figure 11–6.

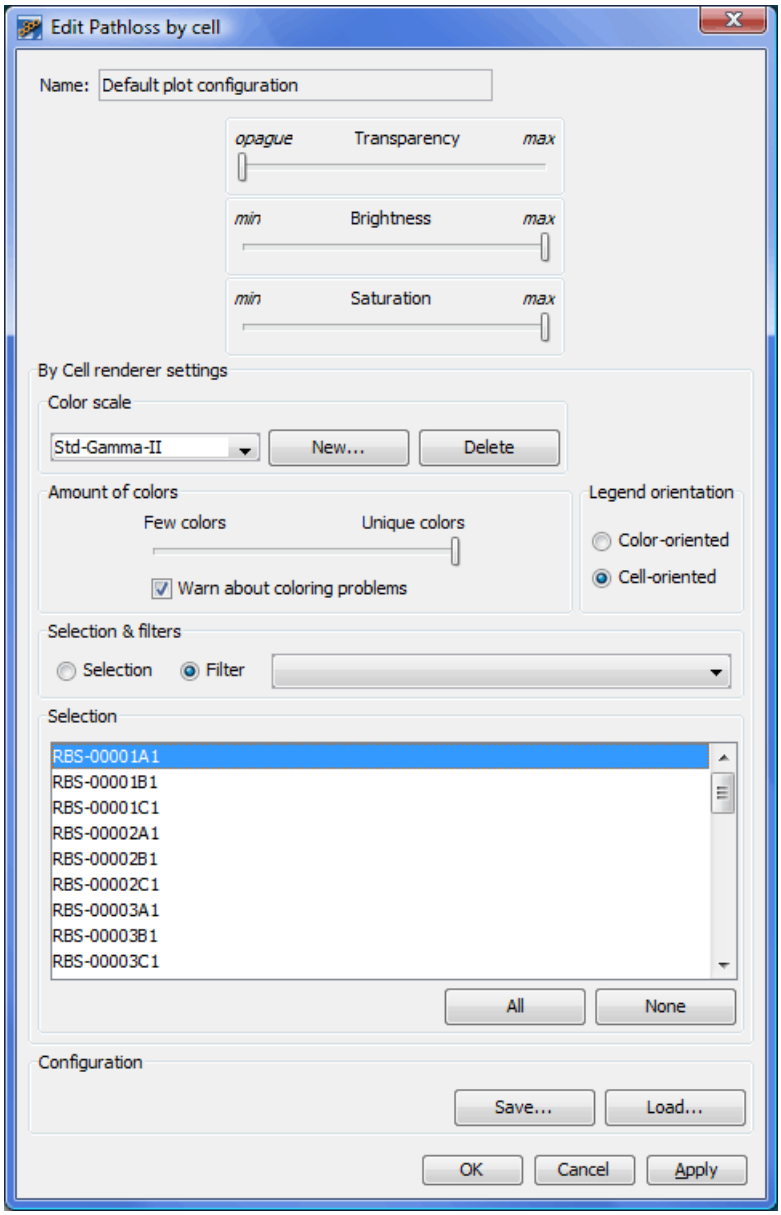


Figure 11–6 Plot properties for Dynamic lookup rendering, parameters

Name	Read-only name of the configuration. The XML file with the plot settings is named `<Name>-<plot name>`. Example: `Default plot configuration-lte-analysis-dl-utilization.xml`.
Transparency	Ranging from opaque to max, regulated by slide bar
Brightness	Ranging from min 0 to max 100%, regulated by slide bar
Saturation	Ranging from min 0 to max 100%, regulated by slide bar
By cell renderer settings (or similar id related title)	
Legend orientation	Sorting rules of colors in the map legend, either of: • Color-oriented - sorted by color • Cell-oriented - sorted by ID, for example by cell name ***Note:*** *Color-oriented legend requires that a color corresponds to exactly one ID, otherwise "..." appears to the right of the color instead of an ID, as the color in this case corresponds to more than one color.* *"**Cell-oriented**" is the option for "by cell" plots.* *"BSC-oriented" is displayed for "by BSC" plots.*
Color scale	
Selection from list of available color scales, predefined or your own	
New	Opens the **Color scale tool** to create your own color scale
Delete	Deletes the selected color scale
Amount of colors	Number of colors to use for color coding, between "Few colors" and "Unique colors"
Warn about coloring problems	Option to get a warning message if an item has changed color after zooming or panning, or if multiple items are mapped to a specific color. The warning might look like: • *There are N identities drawn with the same color. Increase number of colors to avoid collisions.* • *There are N identities that has changed color after zooming or panning. Increase number of colors to avoid changes of colors.* **Tip:** If you get this warning, move the slide bar closer to "Unique colors"
Selection	
Selection & filters	Applies a filter, or individual selection from an area or explorer, to limit the number of plotted items
All	Selects all items in the list
None	Deselects all items in the list
Save	Saves the plot configuration to a file
Load	Loads a plot configuration from file

Static Lookup Rendering

Static identity plots, for example LTE transmission scheme plots, show colors mapped to an identity. For the example of LTE transmission scheme plots, each bin is color coded with the color mapped to the best transmission scheme in the bin.

Unlike the Dynamic Lookup Rendering, the number of identities to map to colors are static and thus independent of the project.

The **Edit** window of its plot properties might look as in the example below, and the parameters in the **Edit** window are described in Figure 11–7.

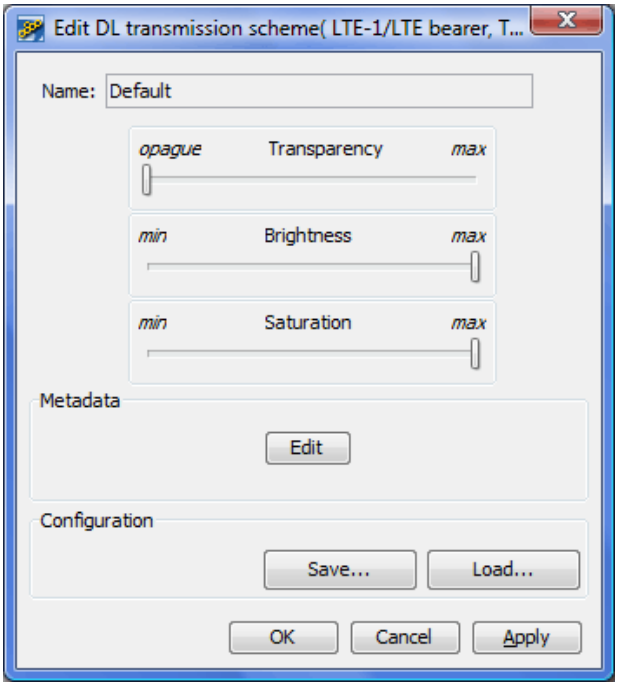


Figure 11–7 Plot properties for Static lookup rendering, parameters

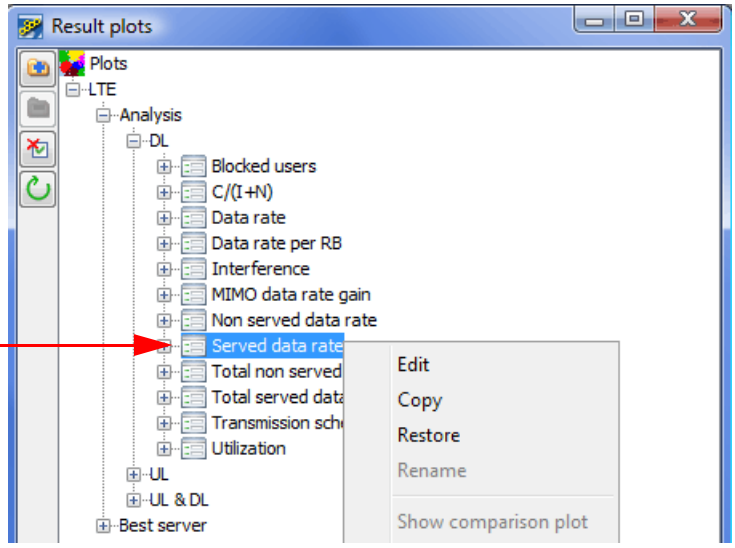
Name	Read-only name of the configuration. The XML file with the plot settings is named `<Name>-<plot name>`. Example: `Default plot configuration-lte-analysis-dl-utilization.xml`.
Transparency	Ranging from opaque to max, regulated by slide bar
Brightness	Ranging from min 0 to max 100%, regulated by slide bar
Saturation	Ranging from min 0 to max 100%, regulated by slide bar
Metadata	**Edit** button opens a window for customizing colors. The metadata window remains to document in this manual.
Save	Saves the plot configuration to a file
Load	Loads a plot configuration from file

Location of Plot Configurations

Plot Configurations in the Graphical User Interface

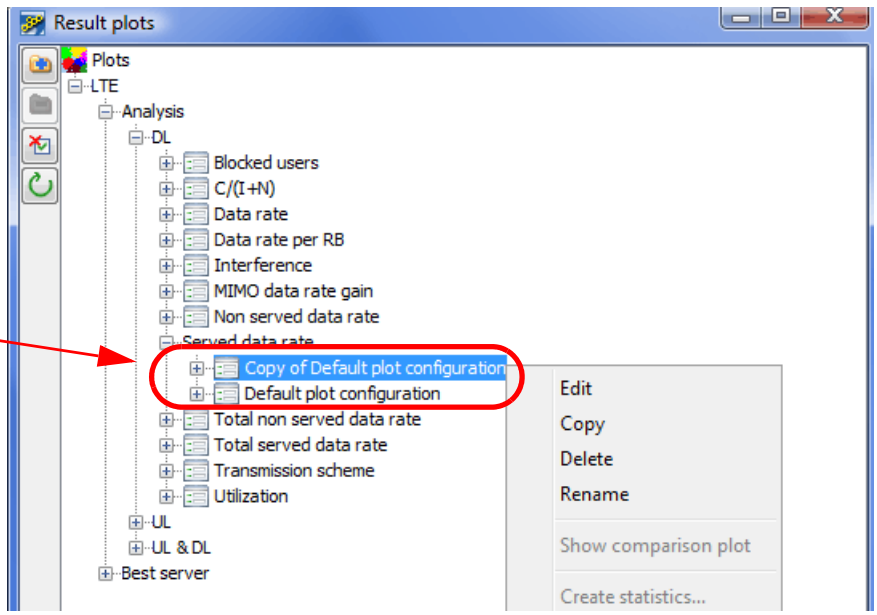
Initially a plot has one plot configuration, a *default plot configuration*. If a plot has only one plot configuration, you do not see its name in the Result plots window. You can though select it by clicking on the plot name, as in the example below:

Single default plot configuration is "hidden" but selectable from the plot name



You may create additional plot configurations, see Copy Plot Configuration on page 11-20. If a plot has two or more plot configurations (including the default configuration) they are listed under the plot name, as in the example below:

List of plot configurations



Plot Configurations and Color Scales in File System

The default location of plot configurations and color scales are as follows:

- default plot configuration folder

  A plot configuration is stored as an XML file in folder **plotconf-user**, by default located in the `TEMSTCP\<version>\Home` under your home folder. Example:

  ```
  C:\Users\plannerA\TEMSTCP\9.1.0\Home\plotconf-user
  ```

- default colorscales folder

  Each plot configuration is associated with a color scale. The color scale is stored as an XML file in a **colorscales** folder, by default located on the same level as the **plotconf-user** folder. Example:

  ```
  C:\Users\plannerA\TEMSTCP\9.1.0\Home\colorscales
  ```

You may copy or save the files to any folder.

For normal use and edit of plot configurations, you do not need to bother where the settings are physically stored. But, when you do any of the following operations you must know the exact location:

- Save Plot Configuration to File
- Load Plot Configuration from File
- Share Plot Configurations
- Create Color Scale

Edit Plot Configuration

You might want to modify the properties of a plot, for example change color coding, transparency, rendering by thresholds instead of values, and so on. In the **Edit** window you can change a lot of properties on how your plot is displayed.

Prerequisites

Calculation results for plots are available from previous analysis runs.

Procedure

Do as follows to edit a plot configuration:

1. Select **Analysis↗Result plots** or click the icon on the vertical toolbar.
2. Locate the plot configuration to edit in the **Result plots** window, see Location of Plot Configurations on page 11-18.

   Tip: To not destroy the default plot configuration, first copy the plot and edit the copy instead. See Copy Plot Configuration on page 11-20.

3. Select the plot configuration by left-click, then right-click and select **Edit** to view the plot properties. (As an alternative you can edit the plot configuration by right-clicking on the plot name in the map legend and select **Edit**).
4. Modify the plot properties as desired, depending on the type of plot you view. See parameter descriptions in Plot Configuration Types on page 11-10.
5. Click **Apply** to save the plot configuration. The settings are saved in your default plot configuration folder.
6. Click **OK** or Cancel to close the window.

Save Plot Configuration to File

You can save plot properties to other than the default plot configuration folder:

1. Open the **Edit** window of the plot, see Edit Plot Configuration on page 11-19.
2. Click the **Save** button to open a file browser.
3. Browse to the desired folder, enter the name of the plot configuration file, and click **OK** to save. The current plot configuration is automatically applied.
4. Optionally save the color scale as well: The program asks if you want to save the color scale. If you select **Yes**, the color scale is stored in the same folder.

Copy Plot Configuration

You can copy a plot configuration to edit or share with other users.

1. Open the **Results plots** window, see Edit Plot Configuration on page 11-19.
2. Select a plot configuration by left-clicking it in the **Result plots** window, see Location of Plot Configurations on page 11-18.
3. Right-click and select **Copy**. The copied configuration is saved and appears under the plot in the **Result plots** window, named as

   ```
   Copy of <copied plot configuration>
   ```

4. To rename the plot configuration, select it by left-clicking, then right-click and select **Rename**.
5. Optionally Edit Plot Configuration to change the properties.

Load Plot Configuration from File

You can reuse color scales or other plot properties by loading settings from a plot configuration file. This procedure is also useful to Share Plot Configurations.

1. Open the **Edit** window of the plot, see Edit Plot Configuration on page 11-19.
2. Click the **Load** button and browse to the desired folder.

3. Select the plot configuration file to load, and click **OK**. The selected plot properties are imported into your currently selected plot.

   If the color scale file associated with the plot configuration is not found in the same folder, you are prompted to select another color scale.

4. Click **Apply** to use the imported plot configuration.
5. Click **OK** or Cancel to close the window.

Share Plot Configurations

You can share plot configurations with other users in two ways:

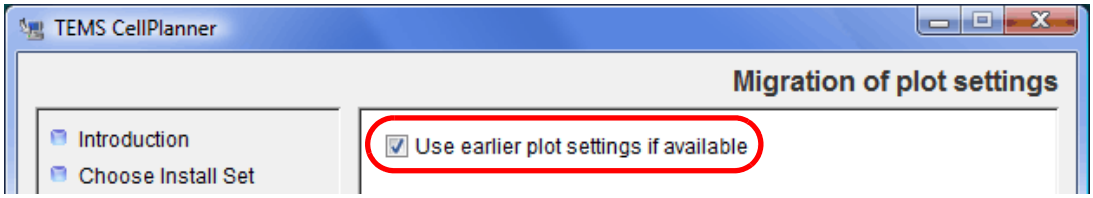
a. Place the file in any folder accessible by the receiving user, who then can load the file from that folder. See Load Plot Configuration from File on page 11-20.

b. Tell the receiving user to copy your plot configuration file to his/her default **plotconf-user** folder, see Location of Plot Configurations on page 11-18. The next time the user opens the **Result plots** window, the plot configuration will appear in the list of plot configurations.

You may rename the file as long as you keep the .xml extension.

Migrate Plot Configurations and Color Scales

When you install a new TEMS CellPlanner version, you can select an option to use earlier plot settings, as in the following screen shot from installation:



The files with the current Plot Configurations (Properties) and Color Scales are then copied to the new folders

```
TEMSTCP\<new version>\Home\plotconf-user
```

and

```
TEMSTCP\<new version>\Home\colorscales
```

respectively.

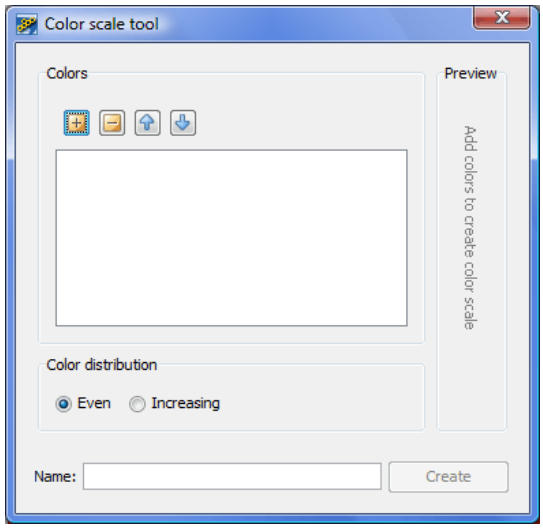
The *TEMS CellPlanner Installation Guide* describes the installation flow.

Color Scales

Create Color Scale

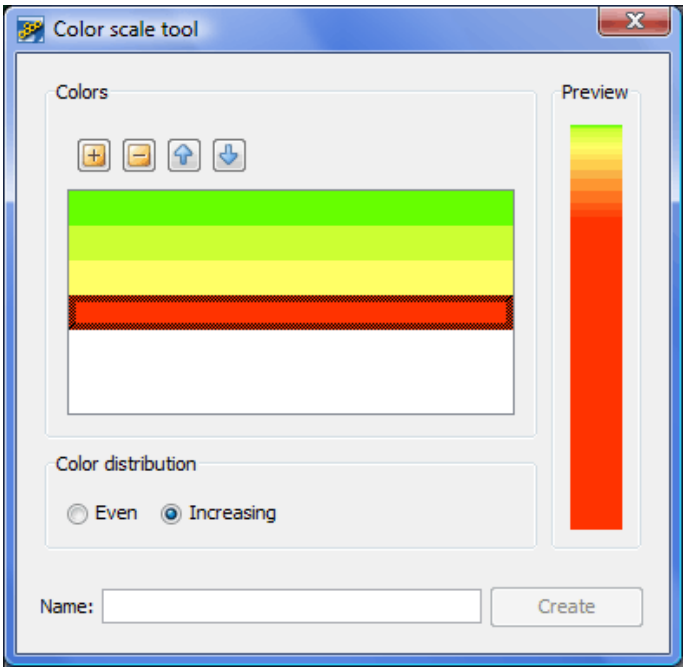
Most plot configurations are associated with a color scale selected from a set a color scales. In addition to predefined color scales in your default colorscales folder, you can create your own color scales and save them to the desired folder:

1. Open the **Edit** window of the plot, see Edit Plot Configuration on page 11-19.
2. Click the **New** button in the Color scale field to open the **Color scale tool**:



3. For each color to add to the scale, click the **+** symbol and customize the color. See Define Color on page 11-23.
4. Click the **-** symbol to remove a color from the scale.
5. Use the arrows to move a color up or down in the scale.
6. Distribute the colors:
   - evenly by option **Even**
   - logarithmic by option **Increasing**

7. The customized color scale might look as in the following example:



8. Enter a name and click **Create**. The color scale is stored as an XML file in the default colorscales folder.

Delete Color Scale

Applied color scales may be permanently deleted:

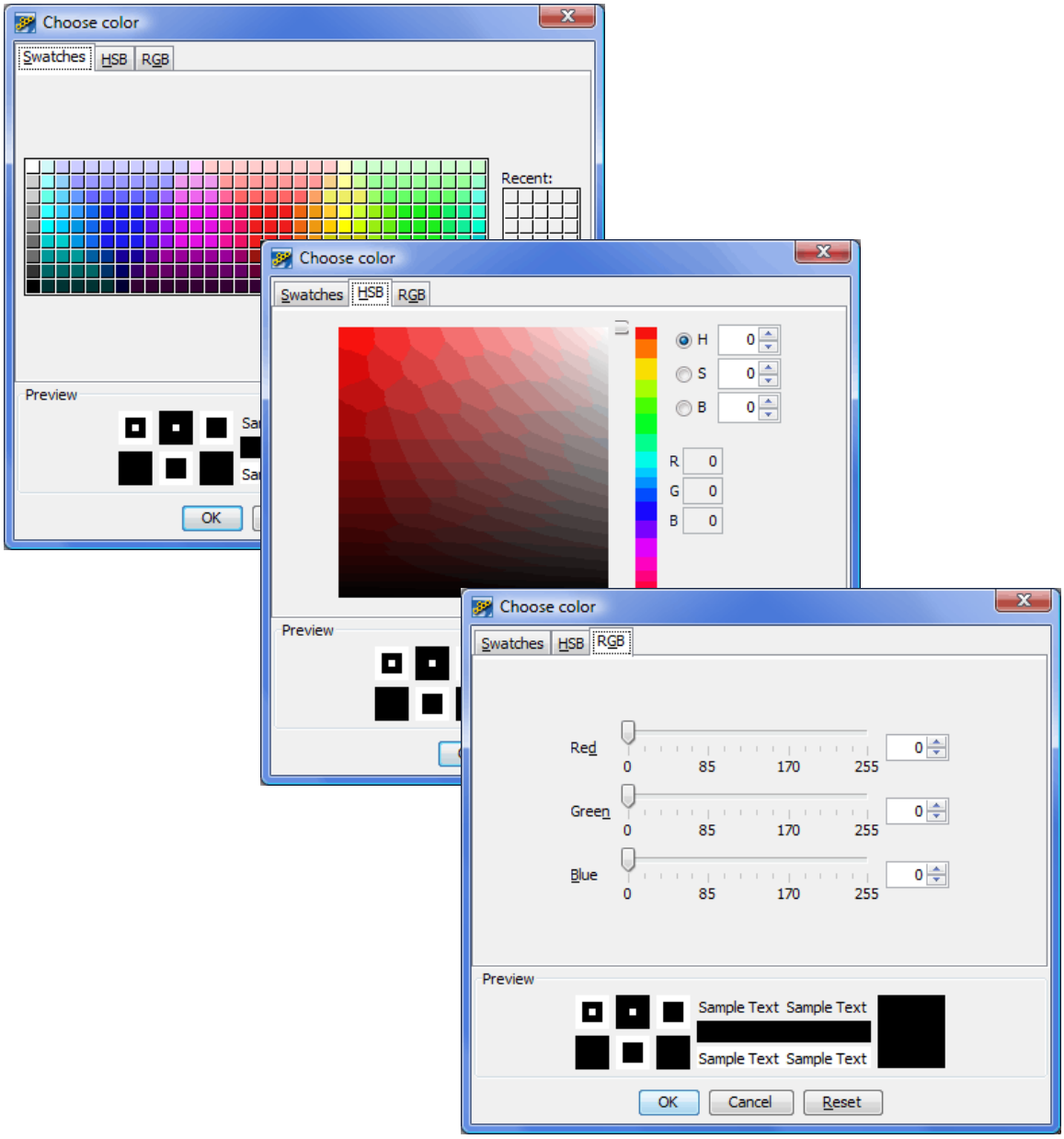
1. Open the **Edit** window of the plot, see Edit Plot Configuration on page 11-19.
2. Select the color scale and click **Delete**. The file is removed from the default colorscales folder.

Define Color

Do as follows to define one color in the **Choose color** window:

1. Pick a color in the **Swatches** tab.
2. Set exact color and nuance in the **HSB** tab.

3. Set the saturation in the **RGB** tab.



4. Click **OK** to confirm the settings.

Plot Snapshots

You can create a copy of a plot to save for later use. The snapshot contains exactly the same data as the original plot and can be exported and printed as the original plot. By using snapshots you can compare the results before and after doing an optimization or analyzing the network with different parameters.

The snapshot is persistent and will stay even after the original plot is deleted. Plot snapshots are stored in XML and MRR files under the Results directory configured in your **User settings**.

Snapshots of a plot, see Save Plot Snapshot, are listed under the plot name in the **Result plots** window, and tagged with a camera symbol

Save Plot Snapshot

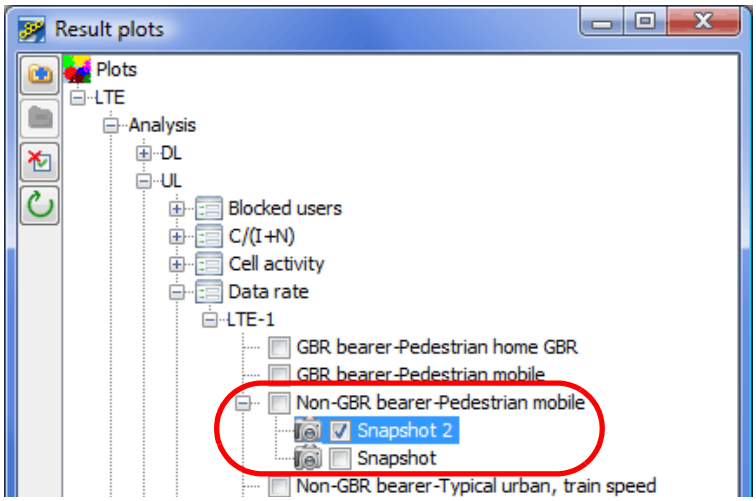
Follow these steps to create a plot snapshot.

1. Select **Analysis↗Result plots** or click the icon on the vertical toolbar.
2. Select a plot by left-clicking it in the **Result plots** window.
3. Right-click and select **Create snapshot** to save the plot.

Display Plot Snapshot

Do as follows to display a saved plot snapshot:

1. Select **Analysis↗Result plots** or click the icon on the vertical toolbar.
2. Locate the plot snapshot and select it as any other plot. The snapshot appears on the map display. Example:



Plot Statistics

You can extract the plotted values to MS Excel format reports. The following plot statistics reporting are available:

- Create Statistics Report from One Plot
- Correlate Statistics from Two Plots
- Correlate Statistics of a Plot with Land Use Map
- Correlate land use map with the selected plot. This report works the other way around compared to Correlate Statistics of a Plot with Land Use Map, here with land use codes displayed per row.

Create Statistics Report from One Plot

Use this procedure to generate a statistical report from a single plot.

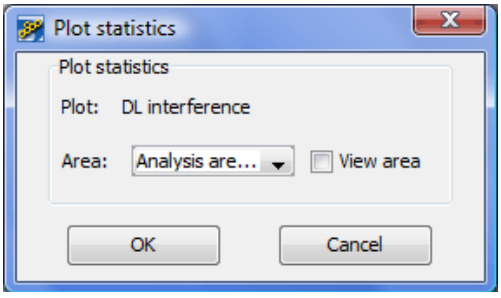
Prerequisites

Plot results must be available from previous analysis runs.

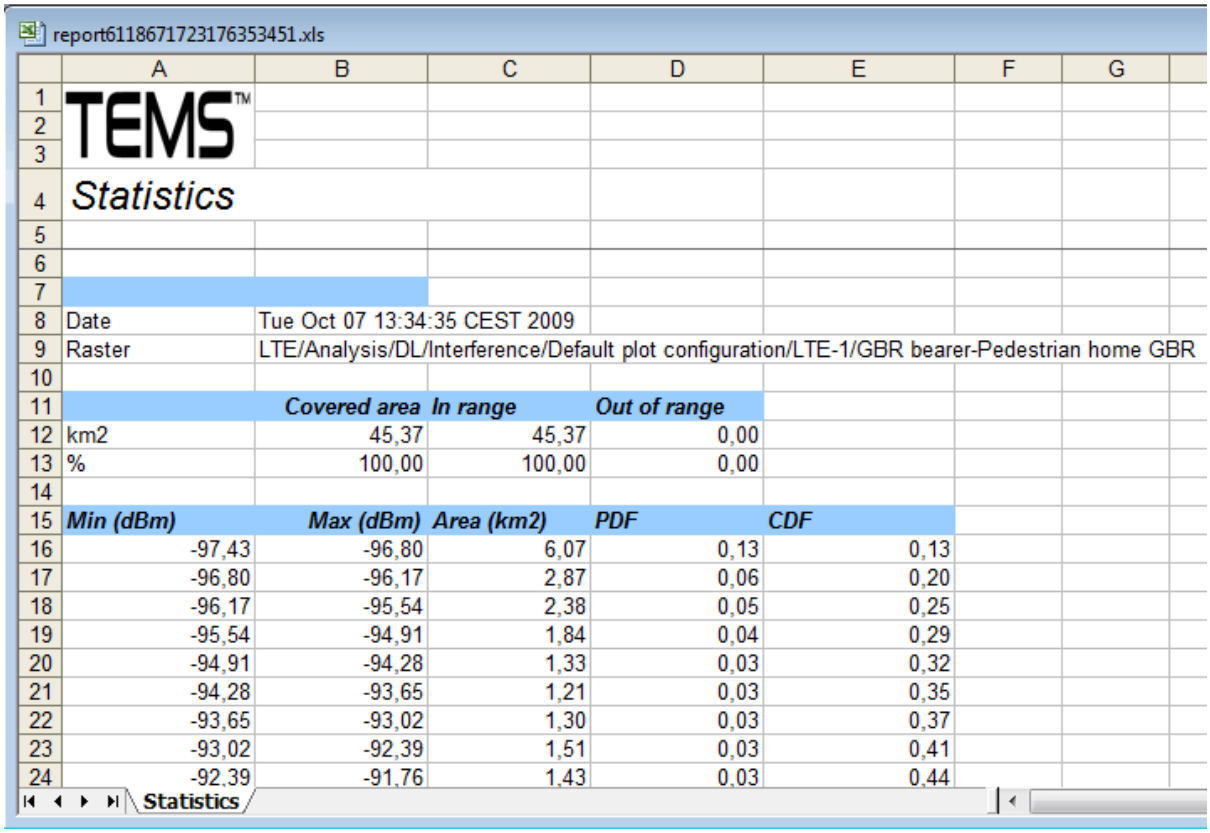
Procedure

Follow these steps to generate a plot statistics report:

1. Select **Analysis↗Result plots** or click the icon on the vertical toolbar.
2. Select a plot by left-clicking it in the **Result plots** window.
3. Right-click and select **Create statistics**.
4. Select the **Area** for the report:



5. Click **OK**. The statistics are generated and displayed in an MS Excel spreadsheet as in the following example:



report6118671723176353451.xls

	A	B	C	D	E	F	G
1	TEMS™						
2							
3							
4	Statistics						
5							
6							
7							
8	Date	Tue Oct 07 13:34:35 CEST 2009					
9	Raster	LTE/Analysis/DL/Interference/Default plot configuration/LTE-1/GBR bearer-Pedestrian home GBR					
10							
11		*Covered area*	*In range*	*Out of range*			
12	km2	45,37	45,37	0,00			
13	%	100,00	100,00	0,00			
14							
15	*Min (dBm)*	*Max (dBm)*	*Area (km2)*	*PDF*	*CDF*		
16	-97,43	-96,80	6,07	0,13	0,13		
17	-96,80	-96,17	2,87	0,06	0,20		
18	-96,17	-95,54	2,38	0,05	0,25		
19	-95,54	-94,91	1,84	0,04	0,29		
20	-94,91	-94,28	1,33	0,03	0,32		
21	-94,28	-93,65	1,21	0,03	0,35		
22	-93,65	-93,02	1,30	0,03	0,37		
23	-93,02	-92,39	1,51	0,03	0,41		
24	-92,39	-91,76	1,43	0,03	0,44		

Statistics

The PDF column (Probability Distribution Function) shows the probability that a bin in the area has a value between the Min and Max values on the row.

The CDF column (Cumulative Distribution Function) shows the probability that a bin in the area has a value below or equal to the Max value on the row.

Correlate Statistics from Two Plots

You can correlate statistics from a plot with the values in another plot, by comparing the values bin per bin.

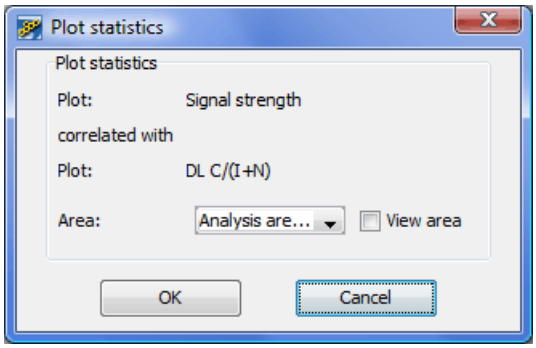
Prerequisites

Plot results must be available from previous analysis runs.

Procedure

Follow these steps to generate a plot statistics report:

1. Select **Analysis↗Result plots** or click the icon on the vertical toolbar.
2. Select a plot by left-clicking it in the **Result plots** window.
3. Right-click and select **Correlated statistics... With other plot**, for example to correlate signal strength with downlink C/(I+N).
4. Select the **Area** for the report:



5. Click **OK**. The correlated statistics are generated and displayed in an MS Excel spreadsheet as in the following example:

report1608558829503318991.xls

	A	B	C	D	E	F	G	H
1	TEMS™							
2								
3								
4	*Statistics*							
5								
6								
7								
8	Date	Tue Oct 13 22:36:36 CEST 2009						
9	Raster	LTE/Best server/Signal strength/Default plot configuration/LTE-1/GBR bearer-Pedestrian home GBR/Layer 1						
10	Correlated raster	LTE/Analysis/DL/C/(I+N)/Default plot configuration/LTE-1/GBR bearer-Pedestrian home GBR						
11								
12		***Covered area***	***In range***	***Out of range***				
13	km2	45,06	45,05	0,00				
14	%	100,00	99,99	0,01				
15								
16			***-10.0***	***2.0***	***14.0***	***26.0***	***38.0***	
17			***2.0***	***14.0***	***26.0***	***38.0***	***50.0***	
18	-120,00	-100,00	0,05	0,00	0,00	0,00	0,00	
19	-100,00	-80,00	0,86	5,41	0,92	0,00	0,00	
20	-80,00	-60,00	0,00	4,86	13,30	4,16	0,00	
21	-60,00	-40,00	0,00	2,03	5,82	5,66	1,25	
22	-40,00	-20,00	0,00	0,02	0,13	0,32	0,26	

The rows show the values or intervals of the first plot, and the values or intervals of the correlated plot in the column heading.

This example is based on two threshold rendered plots, hence the results are presented for intervals instead of values. The value of row 22, column F is 0,32. This means that the signal strength is 20-40 dBm and the DL C/(I+N) is 26-38 dB in 32% of the reported area.

Correlate Statistics of a Plot with Land Use Map

You can correlate statistics from a plot with the land use codes.

Prerequisites

Plot results must be available from previous analysis runs.

Procedure

Follow these steps to generate a plot statistics report:

1. Select **Analysis↗Result plots** or click the icon on the vertical toolbar.
2. Select a plot by left-clicking it in the **Result plots** window.
3. Right-click and select **Correlated statistics... With land use map**, for example to correlate DL data rate with land use codes.
4. Select the **Area** for the report.
5. Click **OK**. The correlated statistics are generated and displayed in an MS Excel spreadsheet as in the following example:

report4258650543330939726.xls

	A	B	C	D	E	F	G	H	I	J
1	TEMS™									
2										
3										
4	*Statistics*									
5										
6										
7										
8	Date	Tue Oct 07 14:16:02 CEST 2009								
9	Raster	LTE/Analysis/DL/Data rate/Default plot configuration/LTE-1/Non-GBR bearer-Vehicular, medium speed								
10	Correlated raster	Land use map								
11										
12		***Covered area***	***In range***	***Out of range***						
13	km2	45,37	41,27	4,11						
14	%	100,00	90,95	9,05						
15										
16			***industrial***	***residential***	***openinurban***	***parks***	***forest***	***sea***	***open***	***blockbuild***
17	0,00	10000,00	0,02	1,55	0,01	0,04	0,14	0,13	1,09	
18	10000,00	20000,00	0,40	3,41	0,81	0,88	0,71	0,40	2,00	
19	20000,00	35000,00	0,79	3,56	1,31	1,41	1,14	0,73	2,74	
20	30000,00	35000,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	
21	35000,00	50000,00	0,68	2,25	1,44	1,33	1,13	0,25	3,69	
22										

12
Integrating Survey Data

This chapter describes how to use survey data from drive tests and other network surveys for propagation model tuning and puncturing in TEMS CellPlanner.

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About Survey Data

Survey data are measurement results from drive tests and other network surveys, captured by measurement collection TEMS Products or similar applications.

TEMS CellPlanner can use the survey data for Propagation Model Tuning or Puncturing to align predictions for the surveyed areas with measured values, or to just View Measurement Data in the Map Window.

Live Network

Important: Measurement data must be imported into a project modeling the live network where measurements were captured. Importing into another project could seem successful if the geographical area and cell parameters are similar to the live network, but the measurements are completely useless in a project not representing the live network.

Matching Measurements to Cells - Overview

The imported survey data consists of measurements from a number of positions in the live network. Each measurement contains a signal strength value and possibly other air interface parameters from the captured signal. The survey data may also include metadata used to find out which cell that transmitted the captured signal. The association of each measurement to a cell is called a *matching*.

TEMS Investigation log files and TEMS Automatic data may include data from multiple cells, but cell metadata (such as antenna types) is missing. Each file from the other Supported Survey Data File Types (Signia, TMR, XML) include measurement data for one cell only, and cell metadata.

TEMS CellPlanner checks that each imported cell exists in the project by comparing site position, antenna location, and antenna configuration. The matching of TEMS Investigation log files and TEMS Automatic data is more complex than importing other files, as TEMS Investigation log files and TEMS Automatic data do not match 1:1 to cells in the project. The probability of matching the survey data to the correct cell increases with the number of air interface parameters available in the metadata.

Matching Measurements to Cells - Details

In traditional survey file formats, one survey file always corresponded to one antenna in a cell. In modern formats such as TEMS Investigation, this is no longer the case. For example, a TEMS Investigation GSM UE (user equipment) mode log file typically contains measurements for a large number of cells.

When you import a log file containing measurements for a large number of cells into TEMS CellPlanner, each measurement must be matched to a cell in the project plan. The parameters available for matching are different depending on the type of measurement. For example, continuous wave (CW) scan data contains only the ARFCN and possibly the BSIC, while UE mode data contains a larger parameter set including the cell identity, scrambling codes, and so forth. The TEMS CellPlanner project may not be fully configured, and correct cell identity values may not be set.

The matching process for each measurement is done in these steps:

1. A definitive positive matching is performed, where it is immediately possible match the measurement specific cell.
2. A definitive negative matching is performed, where it is immediately possible discard a measurement that does not belong to any cell in the cell set.
3. A ranking matching is performed and a score is assigned to each candidate cell depending on the match between configuration and a specific measurement. The measurement position must be close to the cell. The allowed distance increases with the pathloss prediction radius of the cell.

Cell-Based Measurement Selection

When you select to import measurements from specific cells, TEMS CellPlanner determines the parameters to use for matching, using different matching types for different individual measurements if required. TEMS CellPlanner derives all appropriate information for that cell from the TEMS Investigation log file. TEMS CellPlanner can simultaneously extract data for a large number of cells, and a large number of log files, regardless of the recording mode used in the survey.

If a log file was recorded with more than one terminal, the data from all terminals is imported. In some cases a single survey can be composed of data from different terminals. For example, a log file can be recorded with two GSM terminals in UE mode, served by the same cell.

Bins Affected by Adding Measurement Data

Adding measurement data affects only those bins for which data is available in the survey data. Other bins are unaffected by adding measurement data. If multiple values exist in the survey data for the same bin, an average value is used.

Handling Undefined Parameters

The matching engine examines the parameter settings in the project to determine the defined parameters. If the cell identity is not set for a cell, the cell identity parameter is not used for matching measurements to that cell.

In large projects, undefined parameters have an impact on system performance. If all cells in a project have a cell identity, the matching engine can discard measurements containing cell identity mismatches early in the matching process. If a single cell in the cell set has an undefined cell identity, no measurements can be

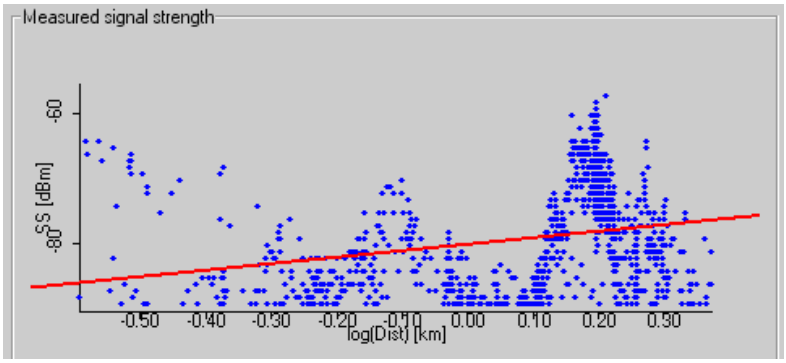
discarded. Irrelevant measurements cannot be discarded until the ranking matching, a much slower part of the matching process.

Balancing Quantity and Quality of Measurements

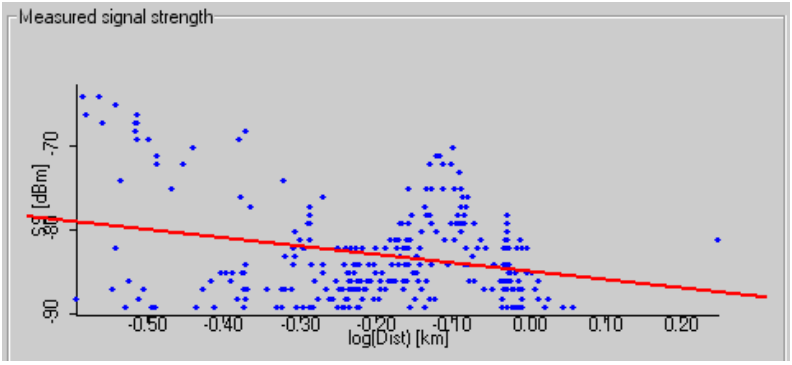
It is important to balance the quantity and quality of imported survey data. For example, when importing two CW scan TEMS Investigation log files, one is recorded with BSIC decoding, the other recorded without. Using default quality settings, both BSIC and ARFCN matches are required, so measurements are not included from the file lacking BSIC information. It may be desirable to adjust the settings. If you know that there are no other cells nearby with the same ARFCN, the tradeoff can be adjusted so that matching is allowed on ARFCN even when BSIC is not known.

Overly relaxed matching rules are often clearly visible in the tuning charts, since the signal strength suddenly appears to increase far away from the cell, indicating that the measurements really belong to a different cell, and that you should use more strict matching rules.

For example, the following chart shows scanning data imported with a relaxed setting to provide matching even when only ARFCN is known:



The signal strength seems to increase with distance due to signal strength from an interfering cell being incorrectly matched to the serving cell. If you import the same data using default settings where both ARFCN and BSIC must match, the chart looks as below, with the spurious measurements from the interfering cell discarded:



Supported Survey Data File Types

You can import and select the following file types as input to Propagation Model Tuning and Puncturing:

- .log files
- .tmr files
- .xml files
- .hd (header) files in Signia format

The drive test data specifies the cell ID, site location, frequency of the signal, antenna specifications, and antenna configurations, along with the signal strengths measured at different locations.

.log Files

.log files are imported from TEMS Investigation, TEMS Automatic or TEMS Pocket. If the contents of a .log file are recorded by more than one terminal, TEMS CellPlanner imports data from all available terminals.

Refer to Supported TEMS Investigation Log File Versions and Modes on page 17-3 for information on importable .log file versions.

.tmr Files

To import .tmr measurement data, the following data must be in the file:

- The first item of Measurement accessories data is specified ("TXDEF01").
- One end record appears in the file and that it appears as the last record.
- One measurement head record appears in the file.

The following assumptions are made during the data import:

- EIRP is calculated from antenna gain + 2.14 + outputPower-cableAttenuation.
- Positions are not converted.
- Frequency is assumed to be in Hz.

.xml Files

The .xml format is the internal log file format of TEMS CellPlanner. It is intended for saving log files imported from other formats. This format contains all information required by TEMS CellPlanner. Some information, such as antenna type, may not exist in the original log file, and must be entered manually if the original log file is imported again.

.hd Files

The .hd files contain surveys in Signia format. The survey actually consists of two files: a header file (.hd) with metadata such as antenna position, and a data file (.dat) with the measurements.

Importing Survey Data

This section describes how to import survey data with measured signal strengths from drive tests and similar network surveys.

Import TEMS Investigation Log Files

Use this procedure to import log files files for Propagation Model Tuning or Puncturing.

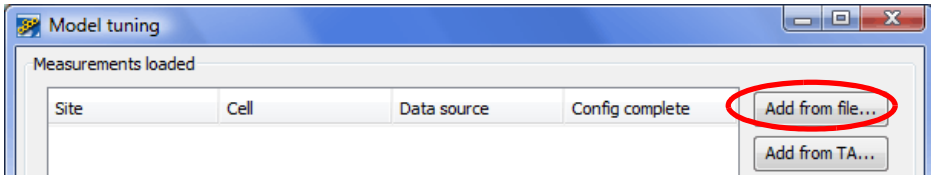
Prerequisites

- Ensure that the required version of Microsoft .NET Framework is installed. Refer to the *TEMS CellPlanner Installation Guide* for installation instructions.
- The survey data to import belongs to Supported TEMS Investigation Log File Versions and Modes.
- The project to which you import the measurement data reflects the Live Network where the measurements were captured.
- An elevation map layer must be selected in the Project settings.

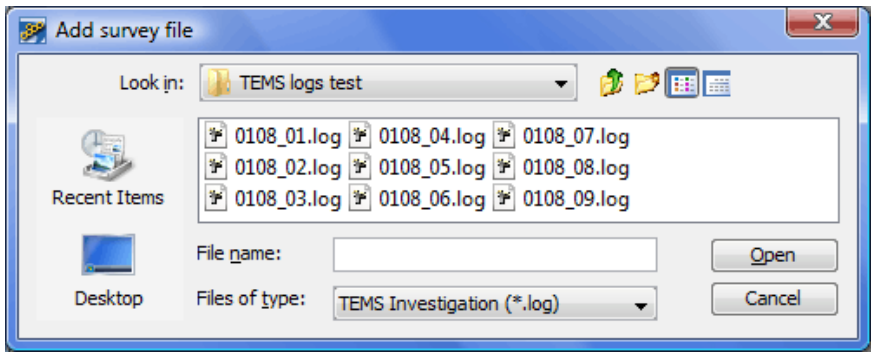
Procedure

Do as follows to import measurements from log files:

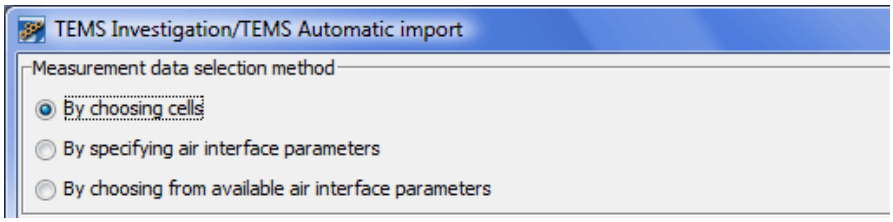
1. To use the data for model tuning, select **Utilities↗Model tuning** to display the **Model tuning** window. To use the data for puncturing of pathloss, select **Utilities↗Puncturing** to display the **Select files for puncturing** window.



2. Click **Add from file** and browse to the folder with the measurement data. Select the ***.log** file(s) to load and click **Open**.The best result from a statistical point of view is achieved if many files are imported.



3. The **TEMS Investigation/TEMS Automatic import** window appears. Select the desired **Measurement data selection method**.


TEMS Investigation/TEMS Automatic import
Measurement data selection method
By choosing cells
By specifying air interface parameters
By choosing from available air interface parameters

   Depending on the method you choose, the contents of the window changes. Follow the links from the alternatives below to learn about the windows:

   - By choosing cell
   - By specifying air interface parameters
   - By choosing from available air interface parameters

   The first method is the preferred one as it provides the best matching opportunities. The other two methods are basically the same. In the first method you manually select the air interface parameters to use for matching, without first checking if these parameters are logged in the survey files. For the third method you read the files to select one of the available air interface parameters as the matching criterion.

4. Optionally define a **Signal strength offset** for constant attenuations, for example receiver cable loss or body loss. The measured signal strength will be increased with this value (in dB). Negative values are allowed, for example an offset of -2 will change a measured signal strength of -90 dBm to -92 dBm.

5. Click **Import**. The import process starts and a status bar displays the progress.

6. When all measurements are imported, the **Model tuning** (or **Select files for puncturing**) window is updated with the imported files.

7. If the **Config Complete** option is cleared for any file, some information is missing. For all incomplete files, you must add information for EIRP, antenna type, height, tilt and azimuth angles not found in the imported file. Click anywhere in the row with the incomplete file. The **Configure** button becomes enabled so you can Configure Survey Data on 12-15.

8. Proceed with the desired action. Select the imported file(s) and use the buttons at the right side of the window to do any of the following:

   - **Show** the route in the map display, see View Measurement Data in the Map Window
   - **Edit** the survey data to better match the cell information to the map, see Editing Survey Data
   - **Save** the selected measurement file for use in the next session. Files are not saved in the project file, but in separate files in a folder you choose
   - **Tune** a propagation model with the survey data (this button is available only when you selected **Model tuning**)

- **Import** the survey data to puncture pathloss predictions (this button is available only when you selected **Puncturing**)

Import TEMS Automatic Data

Use this procedure to import TEMS Automatic data for propagation model tuning and puncturing.

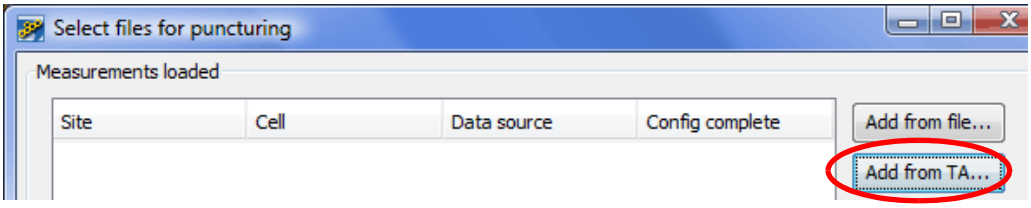
Prerequisites

- Ensure that Microsoft JDBC driver for SQL Server is installed. You can retrieve this software from www.microsoft.com.
- The survey data to import belongs to the Supported TEMS Automatic Database Versions and Modes on page 17-4.
- The project to which you import the measurement data reflects the Live Network where the measurements were captured.

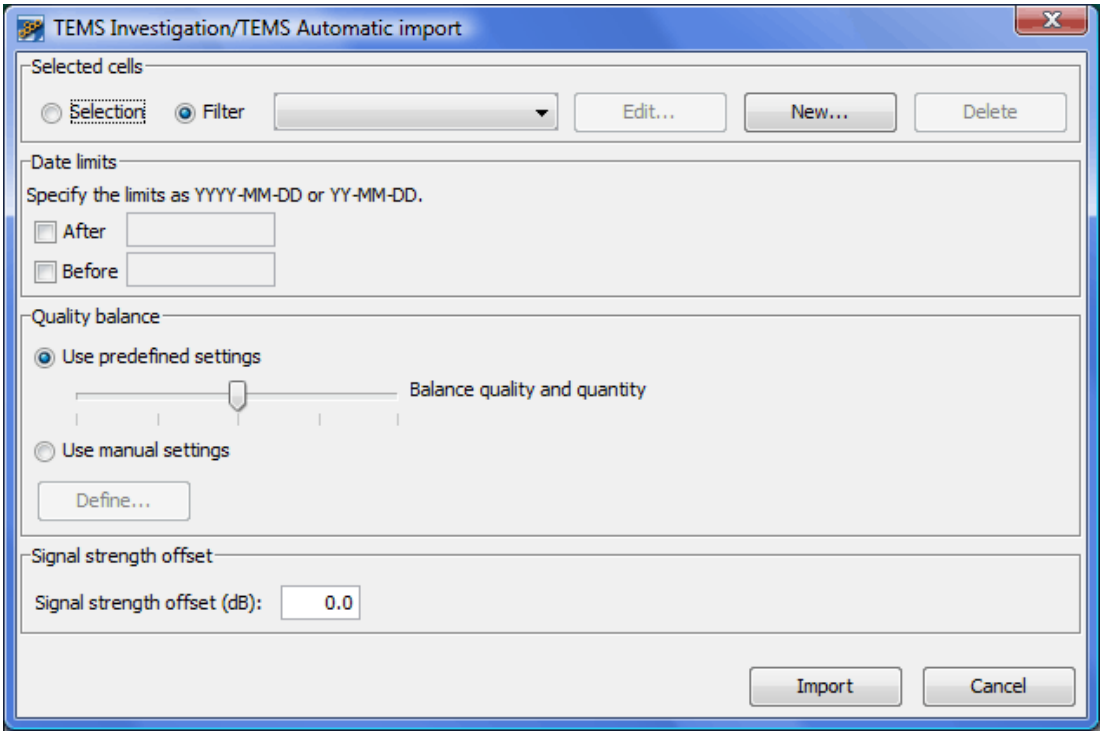
Procedure

Follow these steps to import TEMS Automatic data for model tuning or puncturing:

1. To use the data for model tuning, select **Utilities↗Model tuning** to display the **Model tuning** window.
   To use the data for puncturing of pathloss, select **Utilities↗Puncturing** to display the **Select files for puncturing** window.



2. Click **Add from TA**. The **TEMS Investigation/TEMS Automatic import** window appears as in the example below.

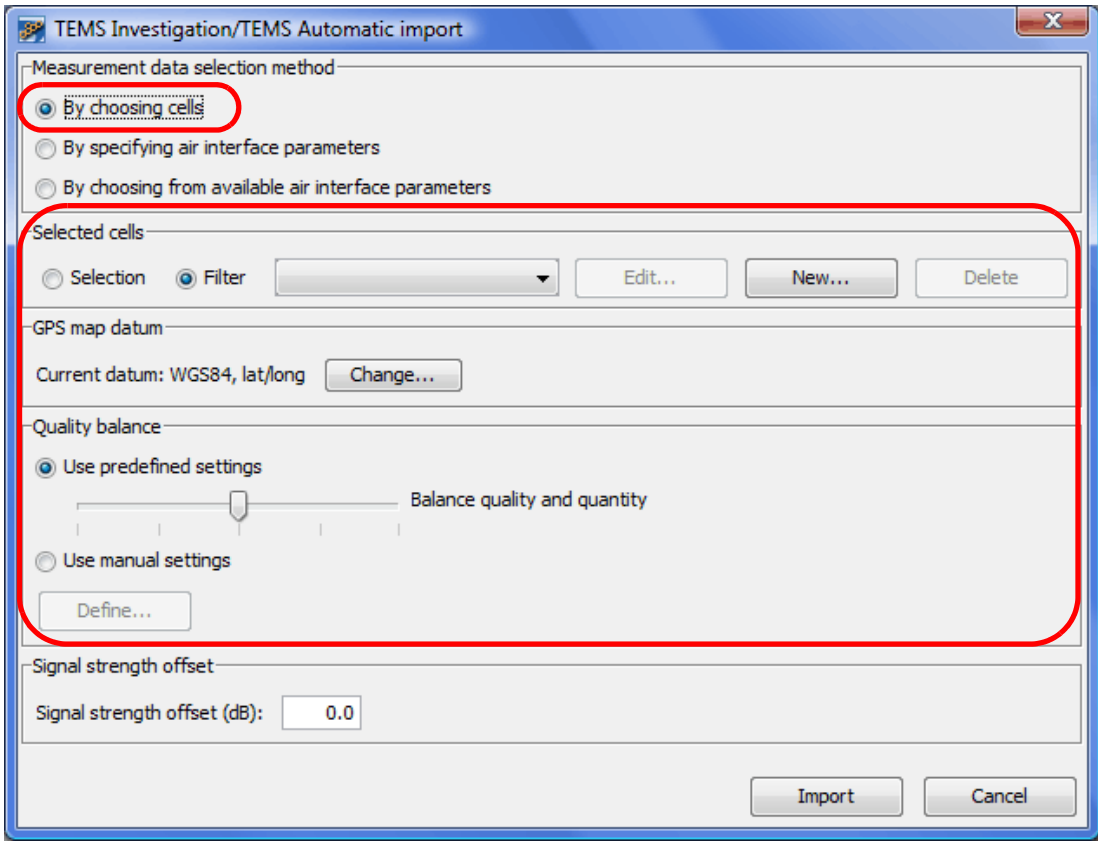


3. Select which cells to import measurements, by using a filter or selection. In large projects, it is recommended that you always specify a cell set for performance reasons. Although irrelevant cells (such as cells located far away from the survey route) can be discarded, the process is faster when you specify a cell set. This is especially important when importing from TEMS Automatic, since the TEMS Automatic database typically contains data for a large geographical region
4. Select the **Date limits** for the data to use.
5. Select the **Quality balance**, that is, what to prioritize for the matching, either of:
   - move the slide bar to use predefined settings for a balanced trade-off between quality (number of air interface parameters in log file) and quantity (number of measurements per cell in log file), or
   - use manual Quality Settings where you select the air interface parameters to use for matching, and optionally to include measurements from neighbor cells
6. The rest of the import is the same as from Step 4 in Import TEMS Investigation Log Files.

By choosing cell

This method to Import TEMS Investigation Log Files provides the best matching opportunities and is therefore the default method. You can configure the following:

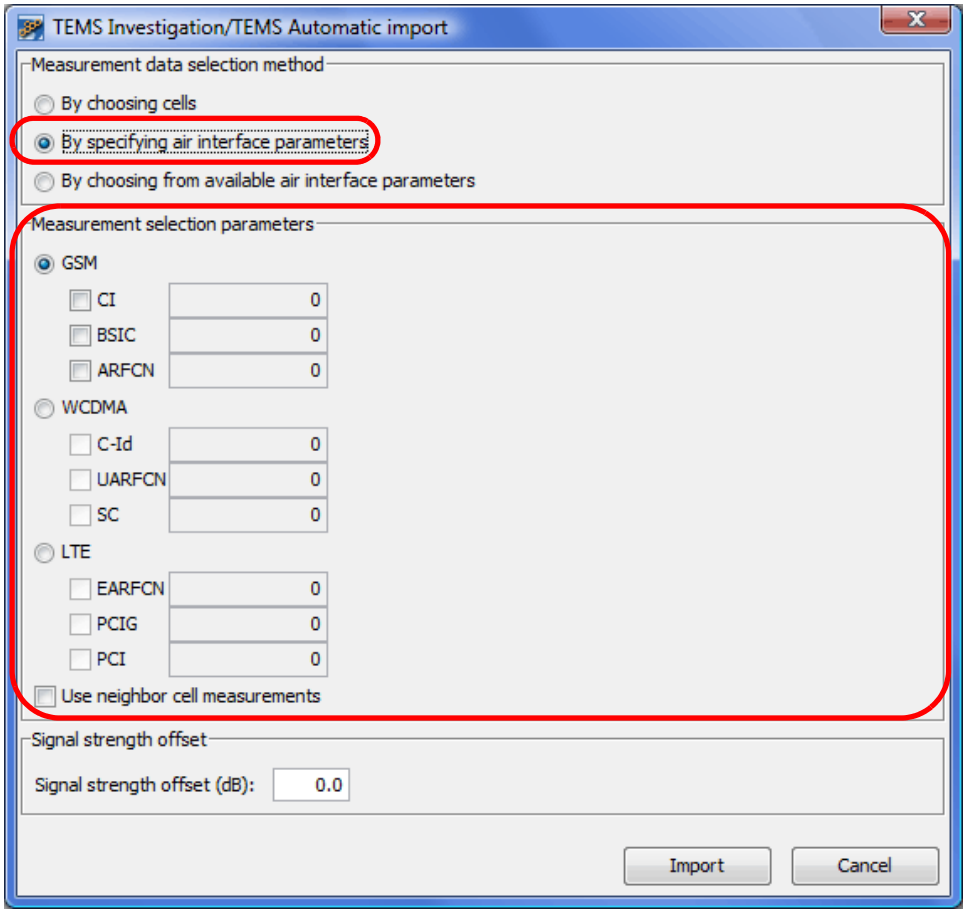
- A filter or selection to limit the number of cells to match. In large projects, it is recommended that you always specify a cell set for performance reasons. Although irrelevant cells (such as cells located far away from the survey route) can be discarded, the process is faster when you specify a cell set.
- The quality balance, that is, what to prioritize for the matching, either of:
  - move the slide bar to use predefined settings for a balanced trade-off between quality (number of air interface parameters in log file) and quantity (number of measurements per cell in log file), or
  - use manual Quality Settings where you select the air interface parameters to use for matching, and optionally to include measurements from neighbor cells



By specifying air interface parameters

This method to Import TEMS Investigation Log Files allows you to select air interface parameters of specified values for the matching.

For GSM or WCDMA you can also include measurements from neighbor cells.



The following air interface parameters with values can be selected:

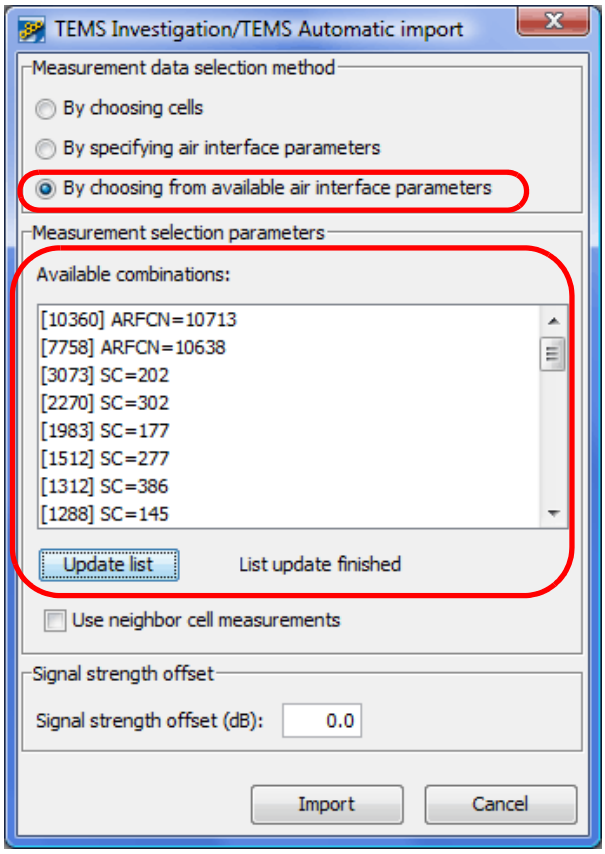
GSM:	**CI**	(Cell Identity)
	BSIC	(Base Station Identity Code)
	ARFCN	(Absolute Radio Frequency Channel Number)
WCDMA:	**C-Id**	(Cell Identity)
	UARFCN	(UTRA Absolute Radio Frequency Channel Number)
	SC	(Scrambling Code)
LTE:	**EARFCN**	useful criterion only for single transmitters (E-UTRA Absolute Radio Frequency Channel Number)
	PCIG	(Physical Cell ID Group)
	PCI	(Physical Cell ID)

By choosing from available air interface parameters

This method to Import TEMS Investigation Log Files allows you to first read which air interface parameters and values that are available in the selected log files, and then select from those the parameter and value to use for matching.

For GSM or WCDMA you can also include measurements from neighbor cells.

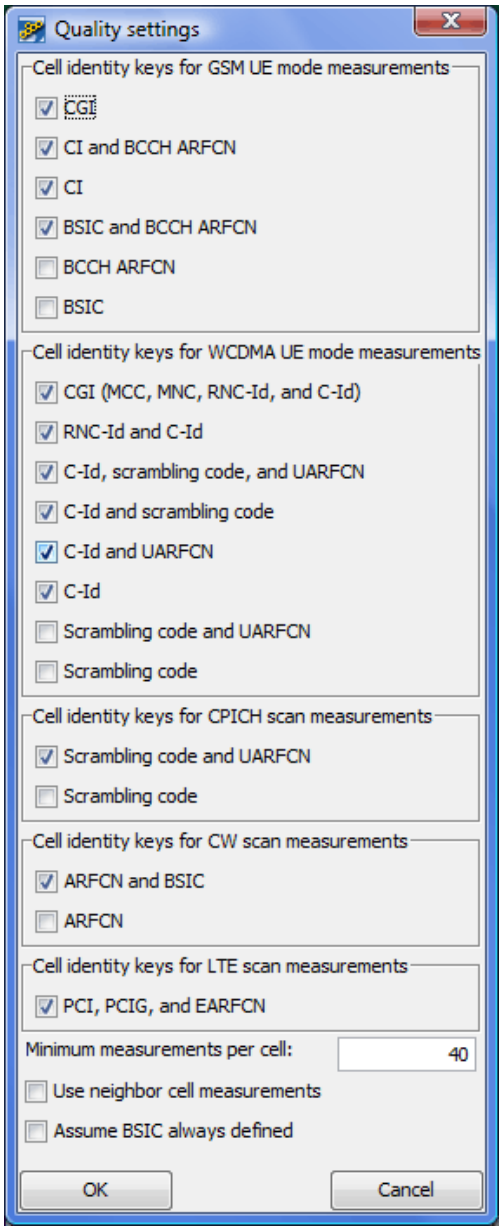
The **Available combinations** window is initially empty. Click **Update list** to fetch available parameters from the log files. The result might look as in the following example:



Quality Settings

In the **Quality settings** window you can select the following matching criteria:

- air interface parameter(s) to use for matching
- number of required measurements per cell for the measurements to be valid
- if measurements from neighbor cells shall be used for matching (supported for WCDMA and GSM measurements)
- if BSIC is expected in the survey file (relevant for GSM)



Fields on Window "Quality settings"

Cell identity keys for GSM UE mode measurements	Possible values: • CGI • CI and BCCH ARFCN • CI • BSIC and BCCH ARFCN • BCCH ARFCN • BSIC
Cell identity keys for WCDMA UE mode measurements	Possible values: • CGI (MCC, MNC, RNC-Id and C-Id) • RNC-Id and C-Id • C-Id, scrambling code and UARFCN • C-Id and scrambling code • C-Id and UARFCN • C-Id • Scrambling code and UARFCN • Scrambling code
Cell identity keys for CPICH scan measurements	Data keys identifying WCDMA CPICH. Possible values: • Scrambling code and UARFCN • Scrambling code
Cell identity keys for CW scan measurements	Possible values: • ARFCN and BSIC • ARFCN
Cell identity keys for LTE scan measurements	Possible values (one selection only): • PCI, PCIG and EARFCN
Minimum measurements per cell	At least this number of measurements are needed per cell for the measurements to be valid. Default = 40.
Use neighbor cell measurements	Option to use measurements from neighbor cells. Relevant only for WCDMA and GSM.
Assume BSIC always defined	Option to assume BSIC always defined for a cell

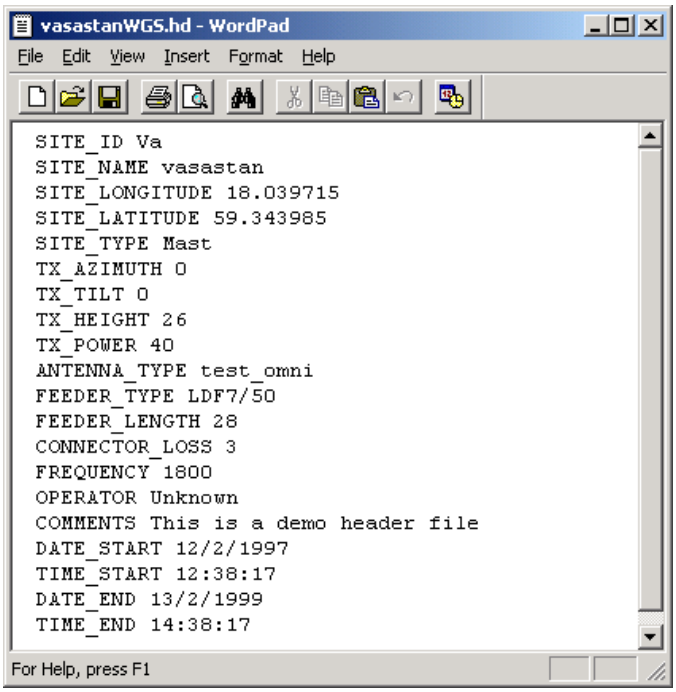
Configure Survey Data

Use this procedure to configure survey files for model tuning and puncturing.

- You can configure only one file at a time.
- Configuring the files ensures that the data can be read and integrated correctly into TEMS CellPlanner.
- Configuring the header files ensures that the survey data can be read and integrated correctly into TEMS CellPlanner for tuning propagation models.

Survey Header Files

Survey header files are in text format, as in the following example:



The information displayed in the **Configure measurement** window might need to be completed or changed to make the survey file usable in TEMS CellPlanner:

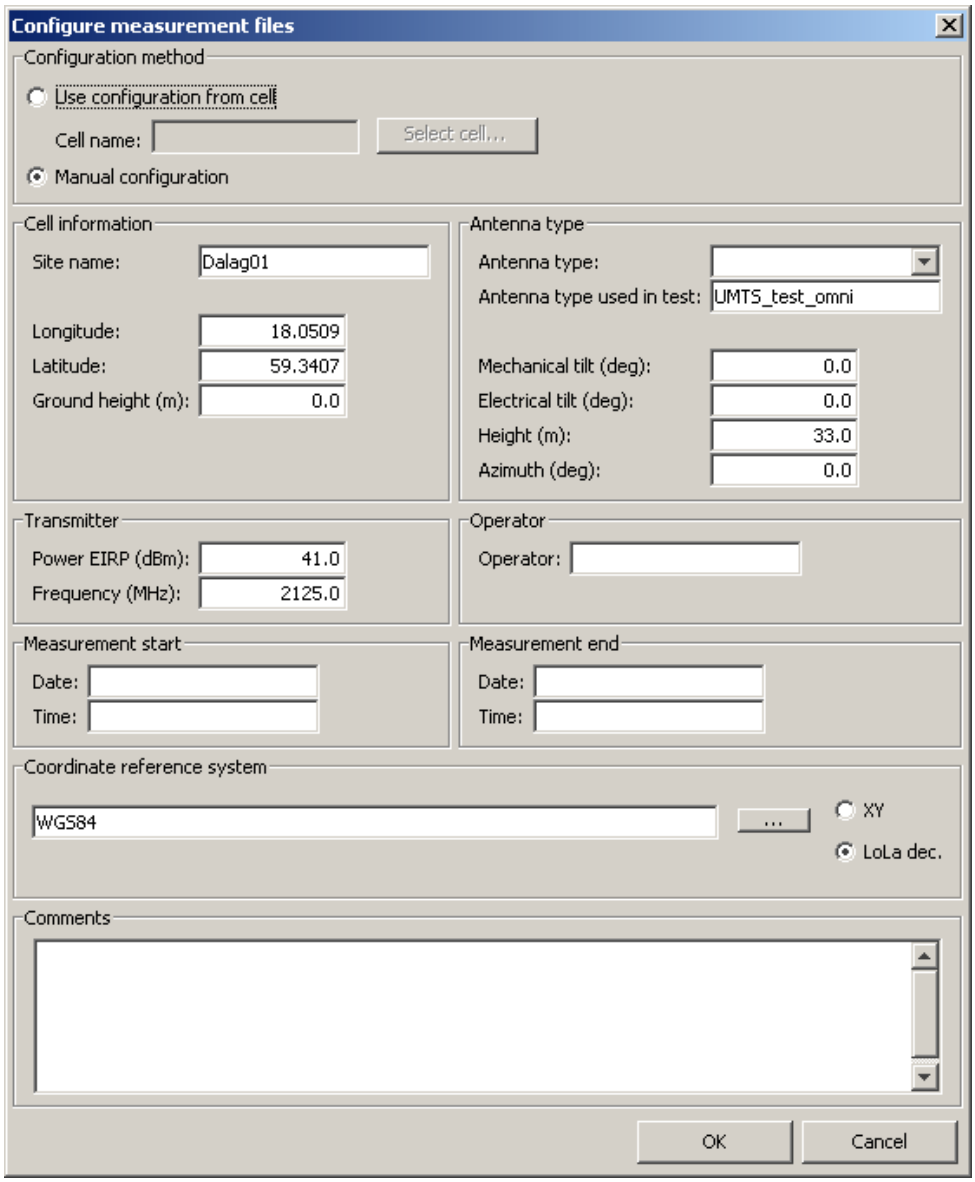
Antenna type information and coordinate reference system often needs updating.

Procedure

Follow these steps to configure drive test, survey, and measurement data:

1. When you add survey files to TEMS CellPlanner, the **Configure measurement files** window is displayed if a survey file requires additional configuration information.

2. To reconfigure an existing file, select a measurement file in the **Puncturing** window and click **Configure**. The **Configure measurement** window appears, with information from the measurement file filled in the relevant fields:



3. Change values as required, and click **OK** to apply the values.

Fields on Window "Configuration measurement"

Cell ID	ID of the cell/site used in the measurement collection
Longitude	Longitude of the cell used in measurement collection. The longitude in the header file must be in degrees. If longitude uses a grid position, you must convert it to degrees and enter the converted degree value.
Latitude	Latitude of the cell used in measurement collection. The latitude in the header file must be in degrees. If latitude uses a grid position, you must convert it to degrees and enter the converted degree value.
Ground height (m)	Ground height in meters of the antenna
Antenna	Antenna type used in the cell
Antenna used in test	Antenna used during measurement collection
Mechanical tilt (deg)	The vertical mechanical tilt of the antenna used during measurement collection
Electrical tilt (deg)	The vertical electrical tilt of the antenna used during measurement collection.
Height (m)	Height of the antenna used during measurement collection.
Azimuth (deg)	Azimuth of the antenna used during measurement collection. Beam direction in degrees, calculated clockwise from north. Range 0 - 360. Default = 0.
Power EIRP (dBm)	The transmit output power used for the drive test, including output power, cable losses, antenna gain relative to isotropic antennas, and so forth.
Frequency (MHz)	The transmit frequency used for the drive test.
Operator	Operator of the site/cell tested.
Measurement start date	Date and time of the start of the measurement collection. Format = mm/dd/yy.
Measurement start time	Date and time of the end of the measurement collection. Format = hh:mm:ss.
Coordinate reference system	The coordinate reference system used for the measurements. It must be the same coordinate reference system used in the project.
XY	Indicates if coordinate reference system uses XY coordinates
LoLa dec.	Indicates if coordinate reference system uses LoLa
Comments	Your notes about the drive test conditions, such as the type of transmitter or receiver used.

Editing Survey Data

If the survey data does not match exactly to the map data displayed in the main window, you can edit points in the survey data to achieve a closer match. A closer match means more accurate calculations for the surveyed area.

Before you can edit survey data, you must import the data and configure it, see Importing Survey Data on page 12-6.

How to Edit Survey Data

• Select a point	Select a single point as a reference point. You can recognize a single point as a sharp turn in the measurement route. See Select Measurement Points on page 12-20.
• Move the point and try to align it	Drag the selected point over the map to the assumed map position and observe the rest of the points. This may be enough to align the data with the map, since many misalignments are due to a mismatch between geodetic reference systems. See Move Measurement Points on page 12-21.
• Delete errors in measurement data	Remove spurious points, single points with obvious displacements, and other data errors from the assumed measurement route. See Delete Measurement Points on page 12-21.
• Move points one at a time to match measurement route	If a mismatch still exists between the measurement survey points and assumed measurement route, select clearly recognized reference points. Move the reference points over the map one at a time in an iterative process until every point seems to fit to the assumed route. Delete erroneous points if necessary. See Move Measurement Points on page 12-21 and Delete Measurement Points on page 12-21,

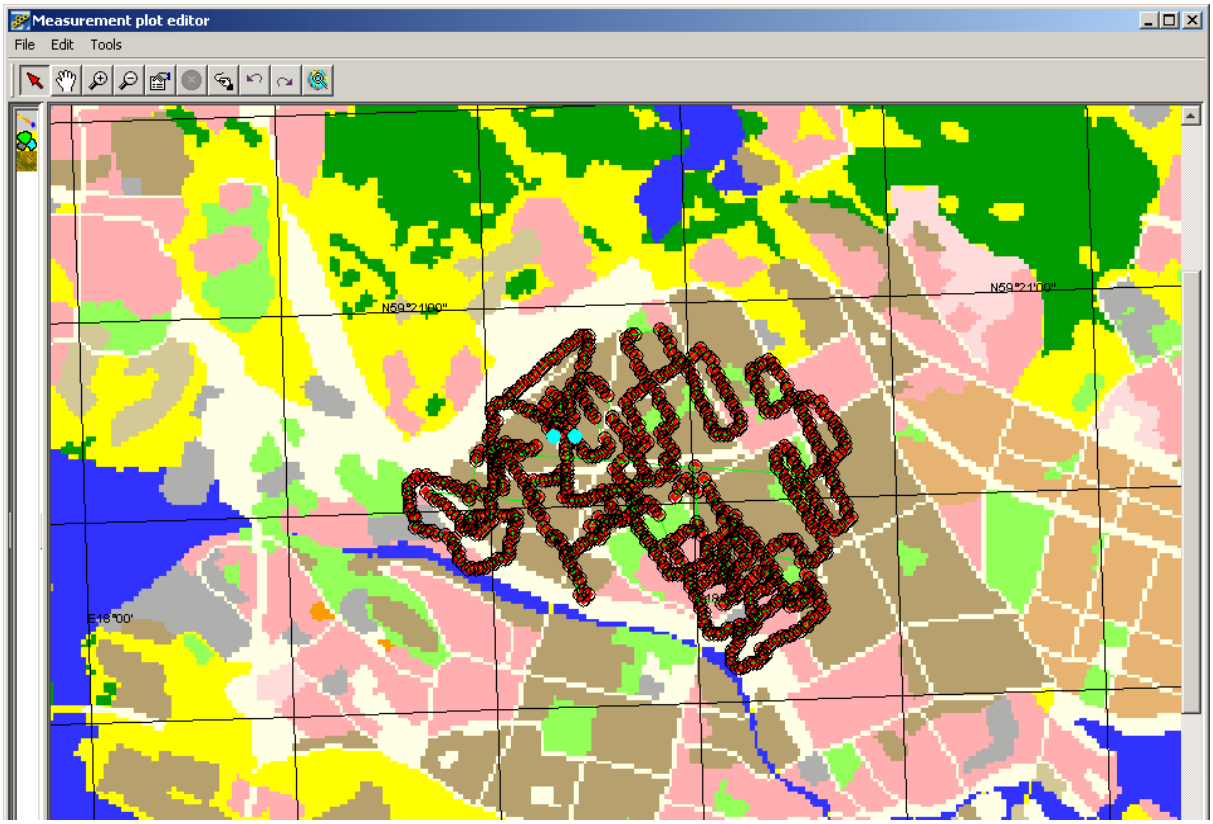
Measurement Data Editor Window

Use this window to modify survey data overlaid on a map. Measurement points in the survey data may be modified by deleting them or changing their coordinates.

You can modify measurement points in the survey data by deleting them or changing their coordinates. You can change them as a whole. You can save the result in the original survey data object at any time.

Window to Use

The **Measurement plot editor** window is similar to the map display window. The editor displays a symbol, a circle approximately 4mm in diameter, for each point in the survey data. Use the **Measurement plot editor** window to edit survey data:



Menus in Measurement plot editor

File	• Open: Opens a map database • Save: Saves the edited measurement data • Save as: Saves the measurement data under a new name • Exit: Exits the Measurement plot editor
Edit	• Undo: Reverts to the previous change. It is possible to undo 100 previous changes. • Redo: Redoes the previous change. It is possible to redo 100 previous changes. • Delete: Deletes selected objects • Restore: Restores deleted objects
Tools	• Editor properties • Zoom cursor

Icons in Measurement plot editor

	Selects an area on the map
	Pans the map display
	Zooms in the map display
	Zooms out the map display
	Displays measurement survey data properties
	Stops current operation
	Edit points tool to mark and drag reference points
	Undo: Retrieves measurement survey data to the state to where it was before last change was made.
	Redo: Retrieves measurement survey data to the state to where it was before last undo.
	Center: Changes map scale and position, if necessary, so you can see the MSF points.

Select Measurement Points

Use this procedure to select individual measurement points of survey data for moving or deleting.

Prerequisite

Before you can edit survey data, you must add the data and configure it using either the **Model tuning** or **Puncturing** options.

Procedure

Follow these steps to select measurement points of the survey data:

1. Select a configured measurement file from the **Model tuning** or **Puncturing** windows, and click **Edit**. The **Measurement plot editor** window is displayed showing red circles indicating the measurement points of the survey.
2. Click the icon of the **Edit points tool** .
3. Click the measurement point to select.
   - To select multiple, subsequent points, press **Shift** and click the next point.
   - To select multiple random points, press **CTRL** and click the next points.
   - To deselect object(s) click anywhere outside the objects.
4. Save the result.

Move Measurement Points

Use this procedure to move individual measurement points of survey data to align them more accurately with the map data.

Prerequisite

Before you can edit survey data, you must add the data and configure it using either the **Model tuning** or **Puncturing** options.

Procedure

Follow these steps to move measurement points of the survey data:

1. Select the point(s) to move, see Select Measurement Points
2. Drag the point(s) to a new position.
   - If you drag a single point, the entire measurement survey is transformed in the same amount as the dragged point.
   - If you select several points, all points between the dragged point and the neighboring points are transformed by two Helmert's transforms so that the dragged point stays at its new position and the two neighboring points stay in their original position.
   - To move single points, select a series of points shown on the map.
3. Select **File↗Exit**. The **Save changes** window is displayed.
4. Click **Yes**. The changes are saved for the editing session, and the **Model tuning** or **Puncturing** window is displayed again.
5. To save editing changes permanently, click **Save** in the **Model tuning** or **Puncturing** window.

Delete Measurement Points

Use this procedure to delete individual measurement points of survey data. You can undo a deletion until you have saved the changes.

Prerequisite

Before you can edit survey data, you must add the data and configure it using either the **Model tuning** or **Puncturing** options.

Procedure

Follow these steps to delete measurement points of the survey data:

1. Select the point(s) to delete, see Select Measurement Points.
2. Press the **DELETE** button on the keyboard. The point(s) change color.

3. Select **File↗Exit**. The **Save changes** window is displayed.
4. To save the changes, click **Yes**. The changes are saved for the editing session, and the **Model tuning** or **Puncturing** window is displayed again.
5. To save editing changes permanently, click **Save** in the **Model tuning** or **Puncturing** window.

Show Survey Routes

You can display drive test routes together with measured signal strength in every bin by importing log files into TEMS CellPlanner.

You can view the routes in two ways:

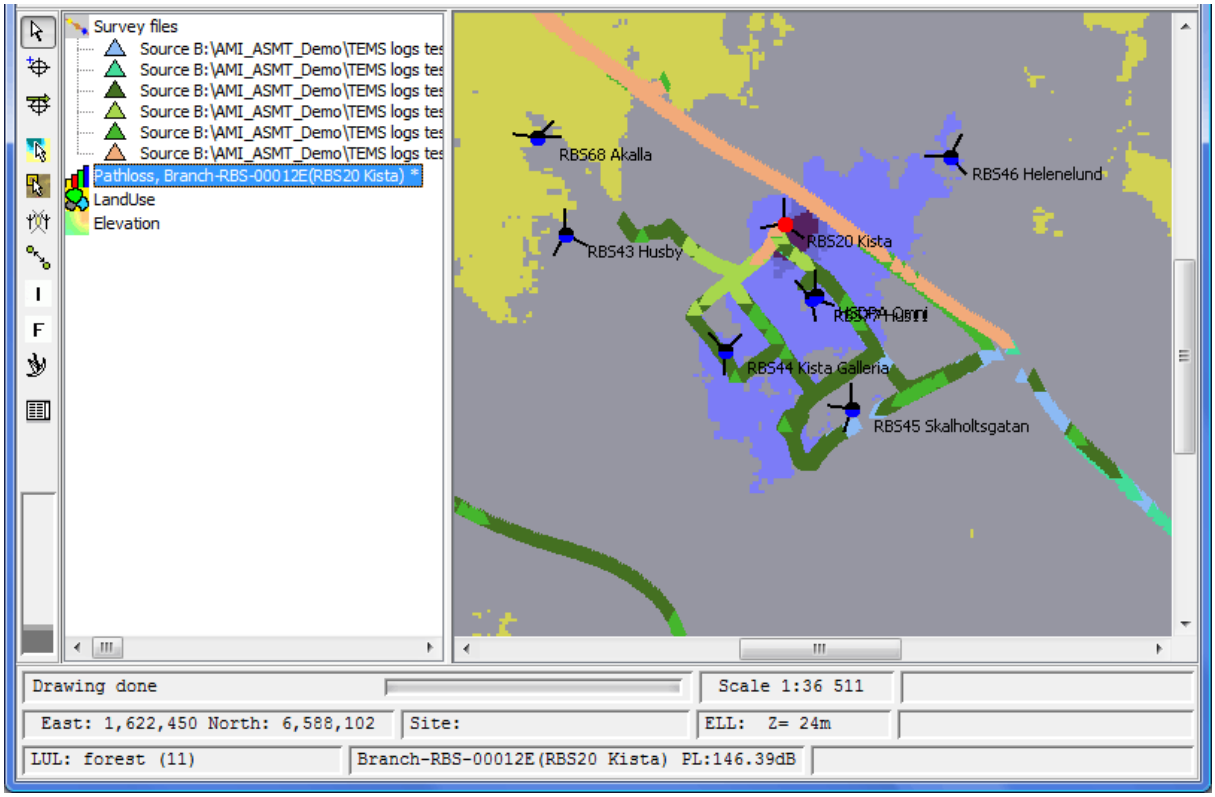
- By Importing Survey Data in the **Model tuning** or **Puncturing** window, and then View Measurement Data in the Map Window.
- Import Measurements into AMI Database with unmasked pathloss, and then Plot Cell Measurements from AMI Database.

View Measurement Data in the Map Window

To view the survey data in the map display window, in the **Model tuning** or **Puncturing** windows, select a file and click **Show**. The measurement data in the file appears as a layer in the map window.

You can view the measured routes in the main window by individually selecting them. For the routes selected, you can display the measured signal strength.

The following example shows survey data displayed in the map window:



13
Automatic Measurement Integration (AMI)

This chapter describes how to use the Automatic Measurement Integration (AMI) feature of TEMS CellPlanner.

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- AMI Process 13-2
- AMI Definitions 13-3

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- Create AMI Database 13-6
- Import Measurements into AMI Database 13-8

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- Plot Transmitter Locations from AMI Database 13-14
- Remove Measurements from AMI Database 13-17

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- Use Unmasked Pathloss from AMI in Pathloss Predictions 13-18

About Automatic Measurement Integration (AMI)

Automatic Measurement Integration (AMI) is a licensed feature of TEMS CellPlanner.

Overview of AMI

AMI reads measurement data log files captured by Automatic Measurement Integration (AMI), converts the imported signal strength values to antenna configuration independent Unmasked Pathloss values, and stores the converted data in a compact format in an AMI Database. Thanks to the removal of antenna information, the measurements are still valid even if antenna related parameters are modified in TEMS CellPlanner. You can change tilt, azimuth, attenuations, gains, antenna patterns and transmit power in your project without destroying the validity of the imported measurements.

The data in the AMI database can be used for the following purposes:

- Automatic Sector Model Tuning (ASMT)
- Measurement overweighting in WCDMA Automatic Cell Planning (ACP), described in the *TEMS CellPlanner WCDMA User's Guide*
- Calculate Pathloss punctured with AMI data

AMI Process

Before importing the measurement files you create an empty AMI database from a project simulating the Live Network**.**

You then import selected files into an open project simulating the live network. The importing project is normally the same as the one used when creating the AMI database, but it is possible to import from another project as long as it reflects the live network.

Measurements include among other a signal strength and the position of the measurement point. When importing the measurement files, TEMS CellPlanner figures out for each measurement which cell in the TEMS CellPlanner project that contributes to the registered signal strength and matches the measurement to a Transmitter Location. Measurements which cannot be associated to a cell are discarded.

As a last stage of the import, the influence from the antenna equipment and antenna pattern is removed from the measured signal strength. The resulting Unmasked Pathloss is stored in the AMI database.

Once a measurement file is imported, it is no longer accessed. All information from the file, including the file name, is stored in the AMI database.

Imported measurements may become useless if the cell configuration in the live network - and the corresponding project - is modified after the drive tests were performed. See Reuse of Measurements on page 13-4 about the changes tolerated before AMI discards the measurements.

You might find that some measurements are not reliable or should be removed from the AMI Database for some other reason. When removing, you select a file name from the AMI database, and all measurements of the file are removed from the AMI database. The file itself is not removed. The average Unmasked Pathloss may need to be recalculated, see Binning. If there are no more measurements for that cell in the AMI database, the Transmitter Location of the cell is removed from the AMI database.

AMI Definitions

The definitions in this section are central when using AMI.

Live Network

Important: Create the AMI database and import the measurement files into a project modeling the live network where measurements were captured. Importing into another project could seem successful if the geographical area and cell parameters are similar to the live network, but the measurements are incorrect and completely useless in a project not representing the live network.

Transmitter Location

A *transmitter location* consists of a site position in longitude and latitude, antenna height and frequency. The values are retrieved from the cell or antenna branch configuration of the TEMS CellPlanner project.

Unmasked Pathloss

Instead of storing the raw signal strength in the AMI Database, the influence from the antenna equipment and antenna pattern is removed and a pathloss value is stored.

The pathloss calculation uses the correct horizontal and vertical angles of the antenna pattern to compensate the fact that the radio signal path between the antenna and the measured point is probably not a straight line.

The resulting *unmasked pathloss* is the pathloss you would obtain from an ordinary pathloss analysis with an antenna branch of zero attenuation and a zero antenna (Omni antenna type with 0 gain in all directions and no other gains/attenuations).

The word *unmasked* relates to the synonym of antenna pattern, namely antenna *mask*. The influence from the antenna pattern is removed, unmasked.

Binning

Measurements are *binned* during import. When two ore more measurements origin from the same *bin* (corresponding to one Transmitter Location) their *average* Unmasked Pathloss is stored in the AMI Database.

If a binned measurement is removed, a new average unmasked pathloss value is calculated for the bin, now excluding the removed measurement.

It is common that measurement data from TEMS Products contain multiple measurements from the same bin.

AMI uses the same bin topology as the elevation map.

AMI Database

Physically, the *AMI database* is a packed file in a folder. You select the location of the AMI database to create or use in your User settings.

The AMI database contains a list of Transmitter Locations. The imported measurements of a cell (actually an antenna branch) are included in the AMI database if its calculated transmitter location matches a possible transmitter location in the importing project.

Together with the transmitter location, the following is also stored: The matching measurements (position of measurement point, source file(s), signal strength) stored per bin, and average Unmasked Pathloss values per bin.

Multiple projects may use the same AMI database, but only one TEMS CellPlanner Client at a time. TEMS CellPlanner provides no control for this single-client access, so you must ensure this by rules in your planning team or by storing the AMI database in a location accessible only by yourself.

Reuse of Measurements

Measurements associated with a certain cell in the AMI Database can be reused as long as the cell configuration is approximately the same as when importing the measurement data.

The first exception from this requirement is that you can change the following antenna related parameters as much as you want without causing the measurements to become invalid:

- Antenna tilt
- Antenna azimuth
- Attenuations
- Gains
- Antenna pattern

- Transmit power

This is possible thanks to having removed the dependency to the antenna equipment and pattern in the saved Unmasked Pathloss.

The second exception is that AMI tolerates minor deviations from the original configuration. The following shows the maximum change permissible:

- Transmitter position (site or antenna) in longitude or latitude: +- 5 m
- Antenna height: +- 2 m
- Frequency: +- 100 MHz

If you modify any of those parameters outside the margins, the transmitter locations of the reconfigured cells remain in the AMI database but are not displayed as available cells. The cells appear again in the list if you restore the parameters to the old values.

Initiating AMI Database

You initiate the AMI database by creating it and filling it with measurements.

Create AMI Database

The purpose of this procedure is to configure the path to the AMI Database, and create an empty AMI database, as a preparation to Import Measurements into AMI Database.

Prerequisites

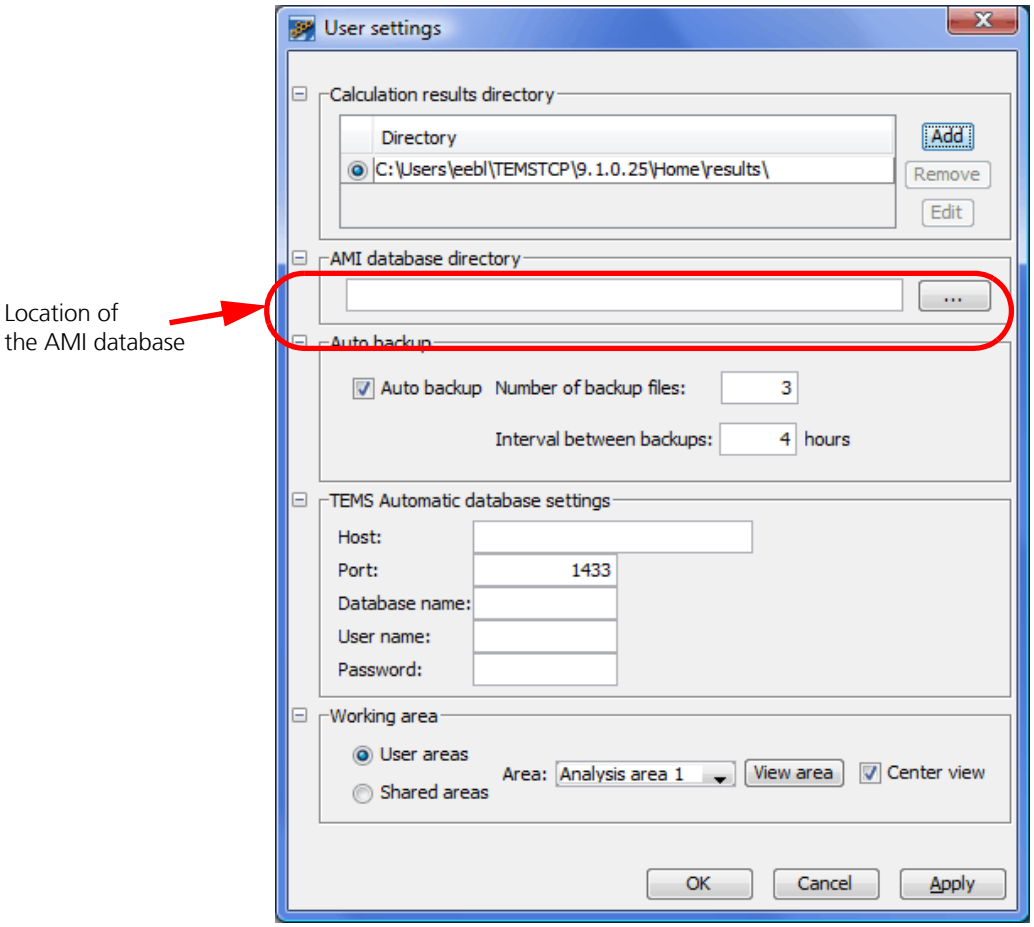
Before creating an AMI database, ensure the following conditions are met:

- The *Automatic Measurement Integration and ASMT* function was selected when installing TEMS CellPlanner.
- The *Automatic Measurement Integration and Automatic Sector Model Tuning* function is selected in your Application Preferences, see Select Licensed Features on page 4-4.
- You have access to an AMI license.
- A TEMS CellPlanner project reflecting the Live Network is opened.

Procedure

Do as follows to create the AMI database:

1. Select **File↗User settings**. The **User settings** window is displayed:



2. Enter the **AMI database directory** name. The AMI database will be created in this folder.

   Note: *The AMI database created from one TEMS CellPlanner project can be accessed by any project using the same User settings, as the name of the AMI database is not saved with the project. It is therefore recommended to choose a name associated with the project reflecting the live network configuration. During import of measurement files it is very important to use the correct AMI database to not accidentally destroy another AMI database.*

   To minimize the risk of having multiple computers accessing the same AMI database, do not select a directory reachable from other computers.

3. Click **OK**. An empty AMI database is created in the specified directory.

You now have a database ready to store measurement files.

Import Measurements into AMI Database

You update an AMI Database by importing measurement data into an open TEMS CellPlanner project with the same configuration as the live network. The measurement data is captured by TEMS Products.

Prerequisites for Importing into AMI Database

Before importing measurements into an AMI database, ensure that the conditions below are met. Refer to the *TEMS CellPlanner Installation Guide* for info on installations and licenses.

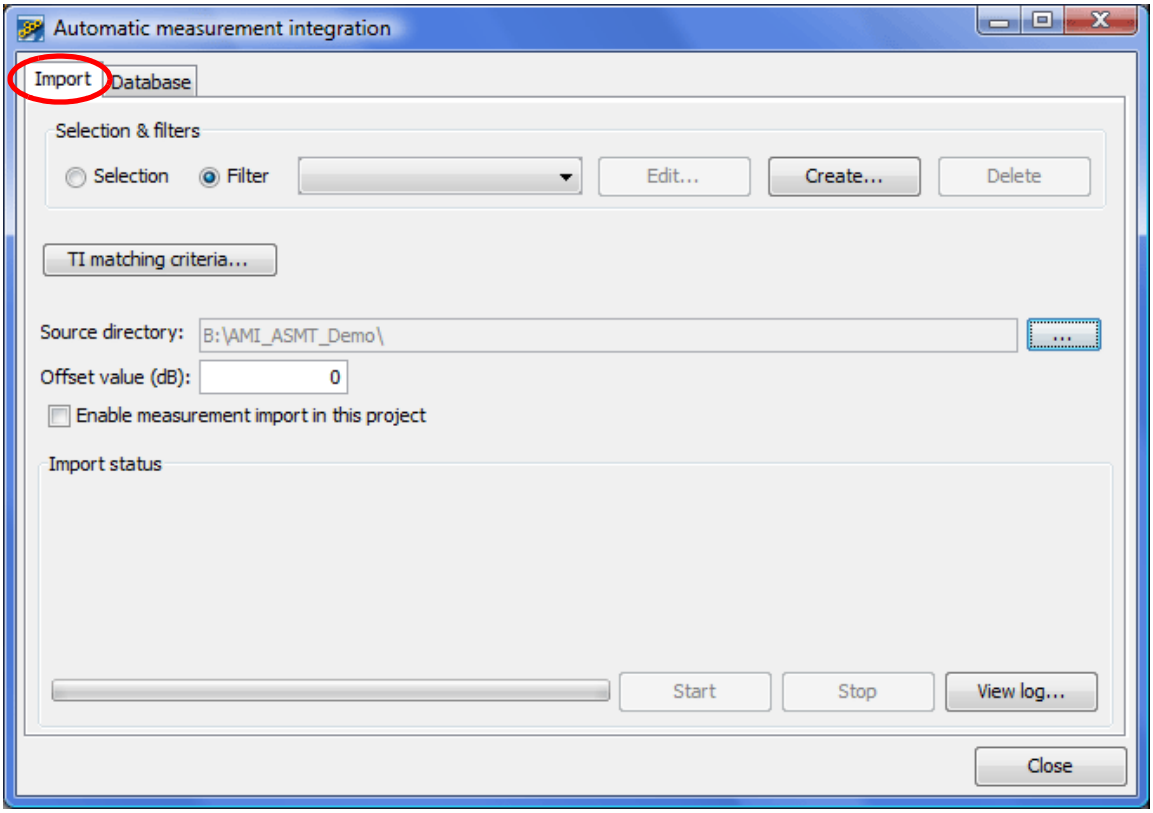
- Microsoft .NET Framework is installed. The version required depends on the version of TEMS Investigation or TEMS Automatic that created the log files. See Supported TEMS Investigation Log File Versions and Modes on page 17-3.
- The *Automatic Measurement Integration and ASMT* function was selected when installing TEMS CellPlanner.
- The *Automatic Measurement Integration and Automatic Sector Model Tuning* function is selected in you Application Preferences, see Select Licensed Features on page 4-4.
- You have access to an AMI license.
- The path to the AMI database directory is configured in **User settings**.
- The AMI database is created and accessible, see Initiating AMI Database on page 13-6.
- You have access to the measurement log files. The files may be stored in the same directory as the AMI database.
- A TEMS CellPlanner project reflecting the Live Network is opened.

Note: *If the project does not reflect the live network where measurements were captured, the data to import is just nonsense to this project.*

Procedure

1. Ensure that all Prerequisites for Importing into AMI Database are met.
2. Select **Utilities↗Automatic measurement integration**. The **Automatic measurement integration** window appears.

3. Select the **Import** tab as in the following example:



4. Optionally limit the number of cells to include in the AMI database by using a filter or a site selection.
5. Optionally modify the **TI matching criteria**.
6. Enter the **Source directory** where the TEMS Investigation measurement files are stored.
7. Optionally set an **Offset value** if all measurements to import are captured from inside a car, or to compensate for any other known attenuation.
8. If you are completely sure that the measurements to import shall be stored in the AMI database of this project, select the **Enable measurement import in this project**.
9. Select the **Start** button to initiate the import. The files in the source directory are imported, and the AMI Database is updated.
10. Click **View log** to view the results of the import.

You now have an AMI database possible to use for any of the following: Calculate Pathloss with puncturing of AMI data, Automatic Sector Model Tuning (ASMT) and WCDMA Automatic Cell Planning (ACP).

Fields on Window “Automatic measurement integration - Import”

Selection & filter	Limits the number of cells included in the matching during the import. All cells of selected or filtered sites are included.
TI matching criteria...	Displays the **AMI matching import criteria** containing options for matching measurements in a log file from TEMS Products to cells in the open project. You may modify the criteria.
Source directory	The location of the measurement files to import. Processed files are moved to subdirectories named `imported` or `failed`.
Offset value (dB)	Added to all imported signal strength values. Typically used to compensate for the attenuation caused by the car when measurements are captured by an in-car antenna. Suitable value for this scenario = 6 dB.
Enable measurement import in this project	By default selected if this currently open project was used when creating the AMI database. Prevents you from the mistake of importing measurement data intended for another project.
Import status	Displays the status of the measurement data import.
Start	Starts the import of the measurement files.
Stop	Interrupts the import of the measurement files.
View log	Displays a log of measurement integration events.

Managing Measurements in AMI Database

Once you have stored measurements in the AMI Database, you can view, remove and plot measurements from the AMI database.

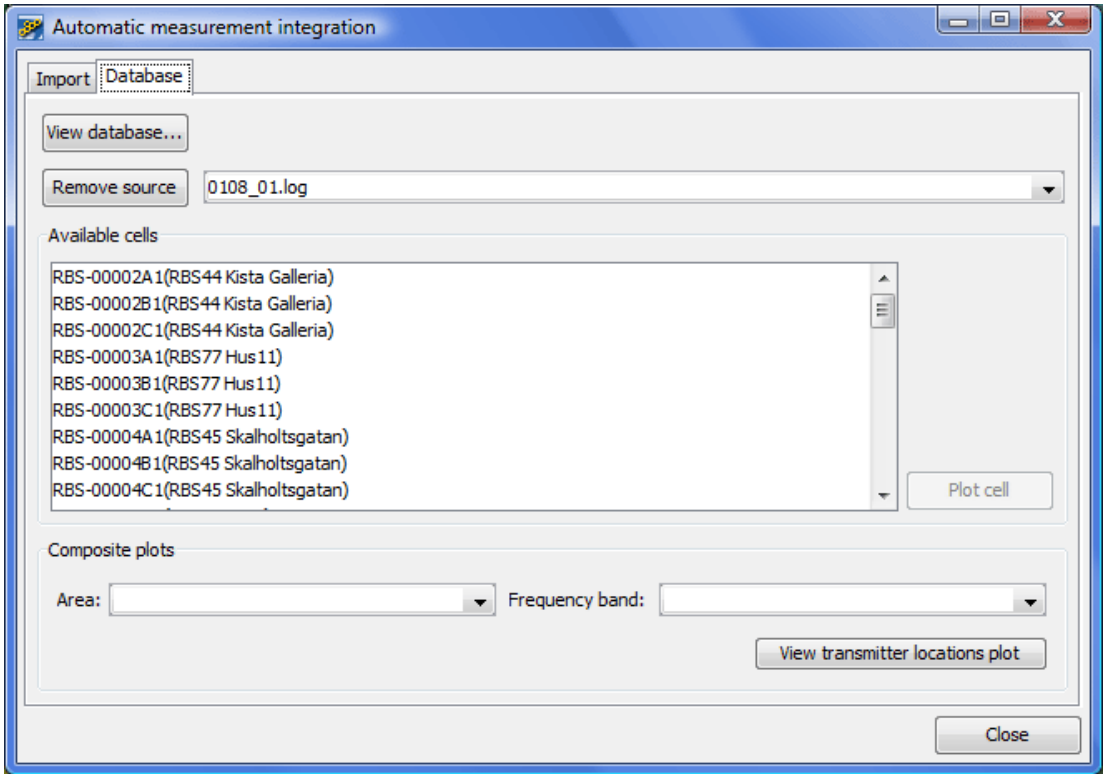
Prerequisites for Managing Measurements in AMI Database

Before viewing, removing or plotting measurements in an AMI database, ensure the following conditions are met:

- The "Automatic Measurement Integration and ASMT" module was installed when installing TEMS CellPlanner.
- You have access to an AMI license.
- A project using an AMI database with imported measurements is opened.
- No other TEMS CellPlanner is currently updating the AMI database. Multiple simultaneous users may read the AMI database, but if any of those updates the AMI database, other users can no longer access it.

Window "Automatic measurement integration - Database tab"

Use the **Automatic measurement integration** window's **Database** tab to view the parts of the AMI database matching the cell configuration in the currently opened project, to remove measurements from the AMI database or to view plots based on the measurements in the AMI database:



Fields on Window "Automatic measurement integration - Database"

View database	Displays the **Measurement database content** window.
Remove source	Removes all measurements of a file from the AMI database. The file is selected from the list to the right of the **Remove source** button. The file itself remains in the `Imported` subdirectory.
Available cells	List of cells in the currently opened project with measurements in the AMI database.
Plot cell	Plots the unmasked pathloss at all measured positions related to the cell selected from **Available cells**.
Composite plots	
Area	Limits the plot to show the selected area only.
Frequency band	Limits the plot to show the selected frequency band only.
View transmitter locations plot	Displays number of transmitter locations per bin in the AMI database for the selected area and frequency band.

View Measurements in AMI Database

Use this procedure to view which cells have measurements stored in the AMI Database.

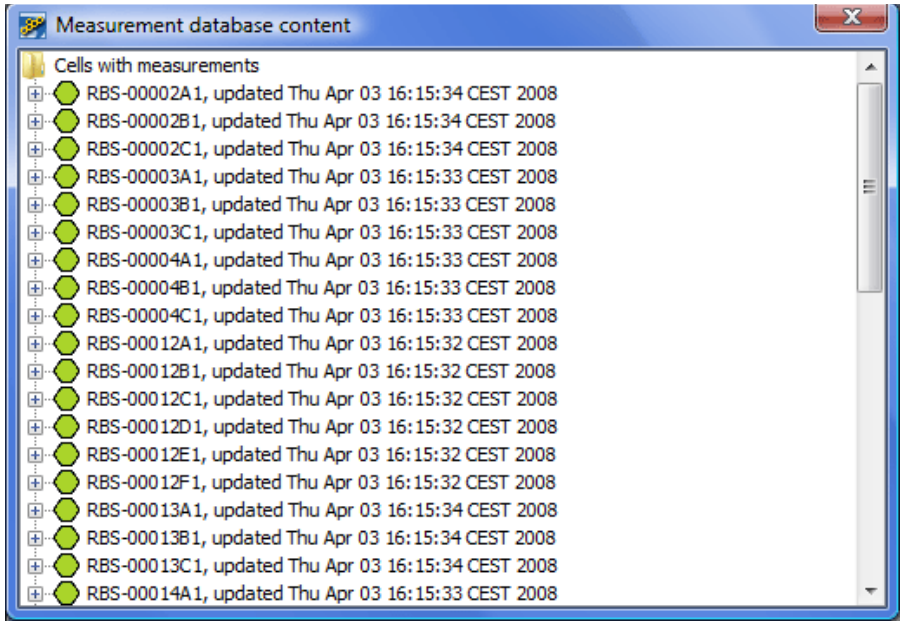
Prerequisites

See Prerequisites for Managing Measurements in AMI Database on page 13-11

Procedure

1. Select **Utilities↗Automatic measurement integration**.
2. Select the **Database** tab to view the Database window, see Window "Automatic measurement integration - Database tab" on page 13-11
3. Click **View database**. The **Measurement database content** window appears. The cells belonging to the transmitter locations in the AMI database are listed

in a tree structure, with the associated files listed per cell, as in the following example:


Measurement database content
Cells with measurements
RBS-00002A1, updated Thu Apr 03 16:15:34 CEST 2008
RBS-00002B1, updated Thu Apr 03 16:15:34 CEST 2008
RBS-00002C1, updated Thu Apr 03 16:15:34 CEST 2008
RBS-00003A1, updated Thu Apr 03 16:15:33 CEST 2008
RBS-00003B1, updated Thu Apr 03 16:15:33 CEST 2008
RBS-00003C1, updated Thu Apr 03 16:15:33 CEST 2008
RBS-00004A1, updated Thu Apr 03 16:15:33 CEST 2008
RBS-00004B1, updated Thu Apr 03 16:15:33 CEST 2008
RBS-00004C1, updated Thu Apr 03 16:15:33 CEST 2008
RBS-00012A1, updated Thu Apr 03 16:15:32 CEST 2008
RBS-00012B1, updated Thu Apr 03 16:15:32 CEST 2008
RBS-00012C1, updated Thu Apr 03 16:15:32 CEST 2008
RBS-00012D1, updated Thu Apr 03 16:15:32 CEST 2008
RBS-00012E1, updated Thu Apr 03 16:15:32 CEST 2008
RBS-00012F1, updated Thu Apr 03 16:15:32 CEST 2008
RBS-00013A1, updated Thu Apr 03 16:15:34 CEST 2008
RBS-00013B1, updated Thu Apr 03 16:15:34 CEST 2008
RBS-00013C1, updated Thu Apr 03 16:15:34 CEST 2008
RBS-00014A1, updated Thu Apr 03 16:15:33 CEST 2008

Plot Cell Measurements from AMI Database

The purpose with this plot is to show where measurements have been captured for a specific cell and site, and to show the Unmasked Pathloss without influence of antenna, feeder, TMA, ASC, attenuations and so on.

Prerequisites

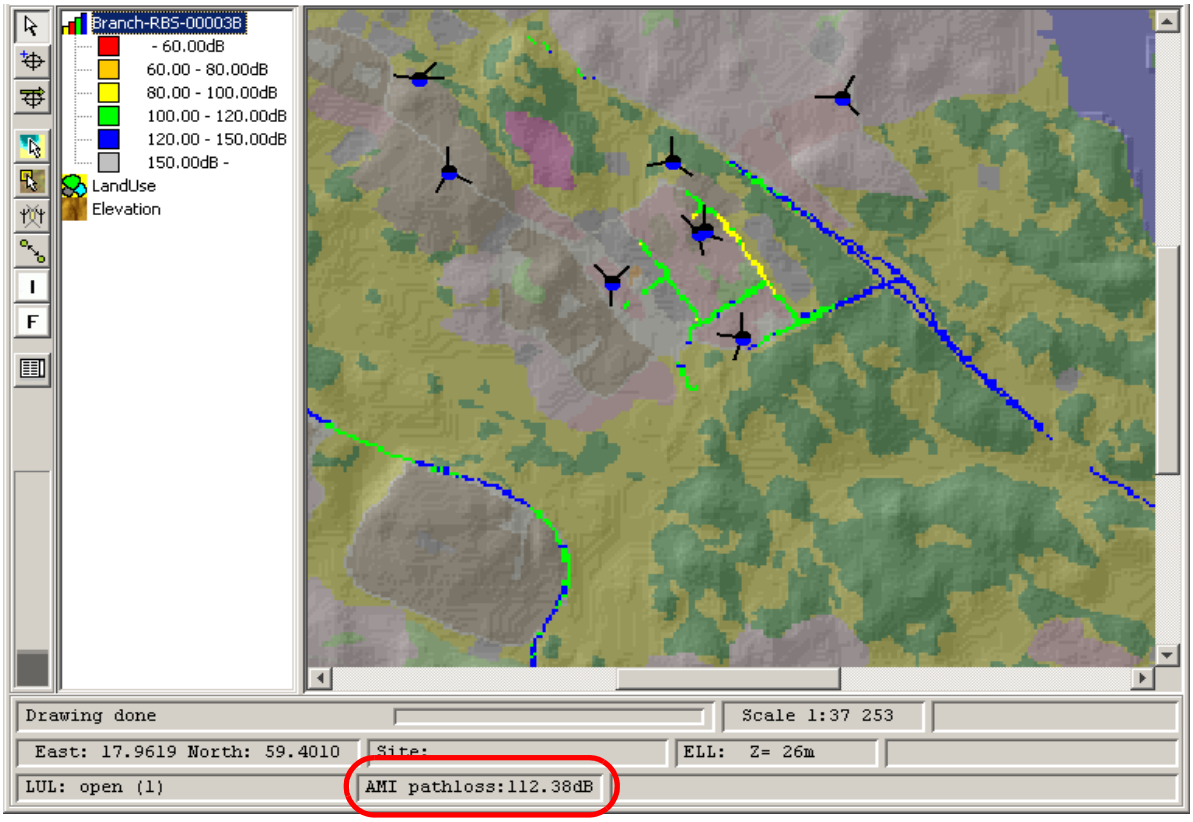
See Prerequisites for Managing Measurements in AMI Database on page 13-11.

Procedure

Do as follows to plot the unmasked pathloss of measurements pertaining to a selected cell in the AMI Database:

1. Select **Utilities↗Automatic measurement integration**.
2. Select the **Database** tab to view the Database window, see Window "Automatic measurement integration - Database tab" on page 13-11
3. Select the cell to plot from the list of **Available cells**.
4. Click **Plot cell**. The map display is updated with the plot.

The picture below shows an example of a cell plot from the AMI database:



The AMI pathloss field in the status bar shows the unmasked pathloss at any position in the map display.

The plot indicates the coverage around the cell, and it can serve as a basis for deciding if more measurement data is needed. *High pathloss indicates bad coverage*.

Tip: If you temporarily switch to a branch with zero attenuation, a zero antenna (Omni antenna type with 0 gain, 0 loss, no feeder loss and so on) and perform an ordinary pathloss analysis, the values in the Single-transceiver plot are comparable with the values in this AMI pathloss plot. This can be used to benchmark your Propagation Model Tuning.

Plot Transmitter Locations from AMI Database

The purpose of the Transmitter locations plot is to show where there are measurements which can be used in the current project, and indicate the measurement quality in terms of number of different transmitter paths. The value per bin indicates the number of transmitter paths to the bin.

The higher number of transmitter locations, the more sites contribute to the measurement data in the actual bin. This indicates a more reliable value of the pathloss, which will lead to more accurate sector models when using Automatic Sector Model Tuning (ASMT) at a later stage.

Prerequisites

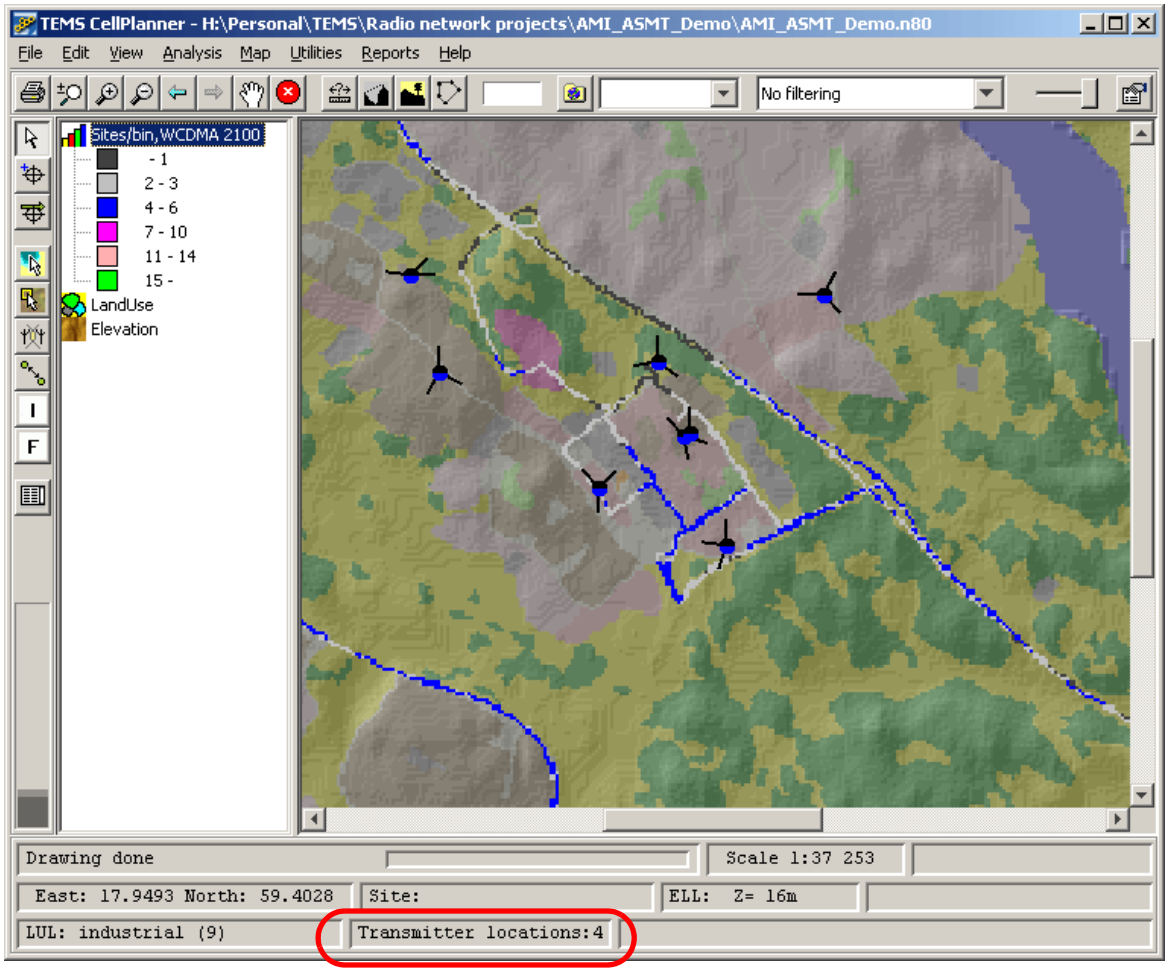
See Prerequisites for Managing Measurements in AMI Database on page 13-11.

Procedure

Do as follows to plot the number of transmitter locations per bin of the measurements stored in the AMI Database:

1. Select **Utilities↗Automatic measurement integration**.
2. Select the **Database** tab to view the Database window, see Window "Automatic measurement integration - Database tab" on page 13-11
3. Optionally limit the extent of the plot by **Area** and/or **Frequency band**.

4. Click **View transmitter locations plot**. The map display is updated with the number of transmitter locations per bin heard by the receiver of the TEMS network testing tool capturing the measurements, as in the following example:



The status bar shows the number of transmitter locations at any point in the map display. The name of the plot is "Sites/bin", but it is actually the transmitter location that is considered, not the site. The same site may for example have antennas on different heights, and each such antenna is counted as one transmitter location.

Remove Measurements from AMI Database

You can remove undesired measurements of selected files from the AMI Database.

Prerequisites

See Prerequisites for Managing Measurements in AMI Database on page 13-11.

Procedure

Do as follows to remove measurements from the AMI database:

1. Select **Utilities↗Automatic measurement integration**.
2. Select the **Database** tab.
3. Select the file which measurements to remove from the AMI database.
4. Click **Remove**. The impact from the selected file is removed from the AMI database.

Using Measurements in AMI Database

The measurements stored in the AMI Database can be used for automatic sector model tuning and puncturing in pathloss calculations.

Use Unmasked Pathloss from AMI in Sector Model Tuning

See Tune Sector Models in chapter Automatic Sector Model Tuning (ASMT) on page 14-31.

Use Unmasked Pathloss from AMI in Pathloss Predictions

You can use measurements from the AMI Database as puncturing data in ordinary pathloss predictions.

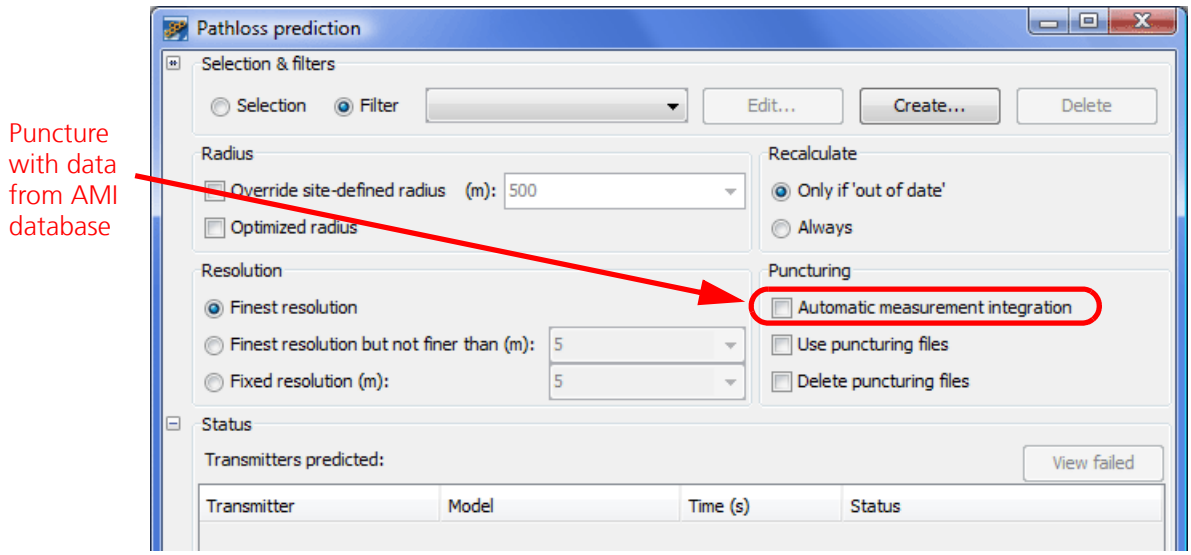
Prerequisites

To calculate pathloss with AMI database, the following conditions must be met:

- The "Automatic Measurement Integration and ASMT" module was selected when installing TEMS CellPlanner
- You have access to an AMI license

Window to Use

Use the **Pathloss prediction** window to integrate measurement data into pathloss prediction calculations:



14
Propagation Model Tuning

This chapter describes how to tune propagation models using survey files from TEMS Products, and using data from TEMS Automatic.

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Regular Model Tuning versus Sector Model Tuning (ASMT)

By comparing the results from drive tests with predictions from TEMS CellPlanner, you can adjust the parameters in the propagation models to minimize the difference between measured and predicted pathloss. You can then use the tuned models as a basis for further predictions to get more realistic results than with the ideal models.

TEMS CellPlanner provides the following comparison and tuning methods for improving the propagation models:

- Model Tuning, also called Regular Model Tuning
  Tunes an existing propagation model for the entire project, even if measurements are provided from a limited area. You tune the model by manually changing the model parameters, checking the tuned result and iterating until you get a satisfying result.
- Automatic Sector Model Tuning (ASMT)
  Creates a tuned a propagation model valid for a measured sector area only, to obtain more accurate pathloss predictions in that sector. This tuning method gives very accurate results in the analyzed sector, and requires no manual model parameter settings.

Important: It is recommended to **perform regular Model Tuning before the Automatic Sector Model Tuning**. Automatic Sector Model Tuning will enhance the accuracy of the model in the cells that fulfill the specified criteria. Such criteria are amount and quality of measurement data from the cell stored in the AMI database, for example enough number of measured bins within a certain sector angle. For the cells that do not have enough data to apply a sector model, the original propagation model selected for the cell will be applied. A regularly tuned model in those cells is of course better than a non-tuned model.

The process of propagation model tuning is roughly as follows:

1. Drive test with TEMS Investigation or CW Transmitter to get measurement data.
2. Perform Regular Model Tuning as described in page 14-4, resulting in enhanced propagation model(s) for the entire project area.
3. Import TEMS Investigation files from the sectors to tune, and store data in an AMI database, see Automatic Measurement Integration (AMI) on page 13-1.
4. Tune the measured sectors with data from the AMI database, see Automatic Sector Model Tuning (ASMT) on page 14-31.

After this tuning, you can use the tuned models for Network Analysis and Automatic Cell Planning, as described in *TEMS CellPlanner WCDMA User's Guide.*

Supported Propagation Models

Propagation models are one of the foundations for the pathloss predictions, giving you a better knowledge about the coverage in the network.

The following propagation models are supported by TEMS CellPlanner:

- 9999 model, valid for the following conditions:
  - 150 MHz up to 2.2 GHz
  - Antenna height between 20 m and 200 m
  - Receiving antenna height between 1.5 m and 5 m
  - From 200 m from the base station up to 100 km
- Urban propagation model, consisting of the following two models:
  - Half-screen model: Generates pathloss above rooftops
  - Recursive microcell model: Calculates propagation between buildings
  - The Urban model is valid for the following conditions:
  - 450 MHz up to 2.2 GHz
  - Antenna height between 5m and 60m, below and above rooftops
  - Receiving antenna height between 1.5 m and 5 m
  - From 0 m from the base station up to (at least) 50 km
- Walfisch-Ikegami model
  - Estimates urban transmission loss in the 900 MHz and 1800MHz bands
- Okumura-Hata Model

For details about propagation models and suitable map datasets for specific models, see the *TEMS CellPlanner Common Features Technical Reference Manual*.

Regular Model Tuning

The objective of prediction model parameter calibration is to obtain values for the prediction model parameters and the land use codes such that they are in agreement with the measured data. When using these calibrated parameters, the predicted signal level should have a minimum difference and variance when compared to the measured signal level.

The calibrated parameters will be used throughout the area covered by the radio system, including sites that have not been covered by measurements. This is based on the assumption that similar areas, i.e. areas with the same land use code, will have the same attenuation due to near field diffraction losses, irrespective of whether measurements had been performed there or not.

Note: Correct land use code classification is essential.

Tune Entire Propagation Models

Use the procedures in the Process for Regular Model Tuning to tune a propagation model for all cells and sectors in a project.

After the Regular Model Tuning, you can refine the tuning in selected sectors by using Automatic Sector Model Tuning (ASMT).

Prerequisites for Regular Model Tuning

Before tuning a propagation model, the following conditions must be met:

- The propagation model to tune is defined in the System explorer
- You have access to measurement data captured in a Live Network modeled in your project

Process for Regular Model Tuning

Tuning the propagation model includes the following steps:

1. Ensure that the Prerequisites for Regular Model Tuning are met.
2. Select Utilities↗Model tuning. The Model tuning window appears.
3. Load a number of RF measurement files using any of the procedures below:

Load TEMS Investigation Log Files	14-6
Load TEMS Automatic Database	14-6
Load Files of TMR Format	14-6
Load Files of Signia Format	14-9
Load Files of XML Format	14-9

4. Depending on the propagation model to tune, use the appropriate procedure from the list on the next page. Irrespective of the selected procedure, the following tasks should be accomplished:

   a. Set land use correction factors to zero for all land use categories.

   b. Set default propagation model parameters.

   c. Perform an auto tuning (or manual tuning).

   d. Note the land use categories represented with too few bins (< 100) and remove them from the tuning window.

   e. Assess the results of the model parameters and the land use correction factors. If there are any results that deviate from an expected one, try to identify the bins that cause this result.

   f. Remove bins by filtering them, either by filtering certain land use types and/or bins above or below certain distances from the site.

   g. Repeat from Step c until the result is satisfactory.

   h. Apply the parameters to update the propagation model with new settings.

   Choose one of the following procedures:

Auto Tune 9999 Model	14-9
Manually Tune 9999 Model	14-11
Auto Tune OH Model	14-13
Manually Tune OH Model	14-14
Manually Tune Urban Model	14-17
Auto Tune WI Model	14-22
Manually Tune WI Model	14-23

Regular Model Tuning: Load Measurement Data

Before tuning a propagation model, the measurement data shall be loaded into TEMS CellPlanner. The supported file formats are as follows:

- TMR, extension .r0x, must be renamed to .tmr before being loaded
- Signia, each survey consists of two files with extensions .hd and .dat
- XML, extension .xml, with same info as Signia files but in other format
- TEMS Investigation log files, extension .log. See Supported TEMS Investigation Log File Versions and Modes on page 17-3.

Except for these files, you can also load TEMS Automatic measurement data, see Supported TEMS Automatic Database Versions and Modes on page 17-4.

Load TEMS Investigation Log Files

See Import TEMS Investigation Log Files on page 12-6.

Note: *Read this if you have loaded survey files captured with CW scan: If the survey route passes an area where the land use type is undefined, the results of the automatic tuning will be unstable and misleading. You can overcome this by removing these points after you have imported the survey files, see Editing Survey Data on page 12-1.*

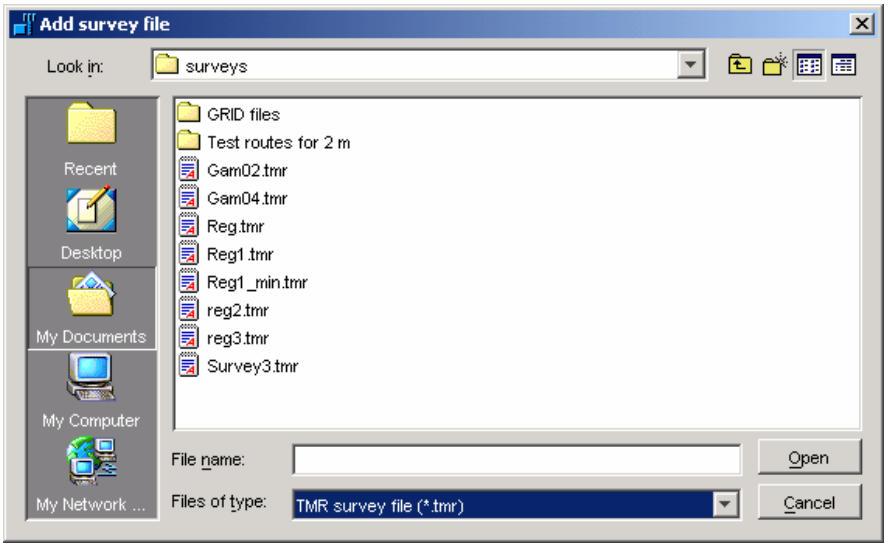
Load TEMS Automatic Database

See Import TEMS Automatic Data on page 12-8.

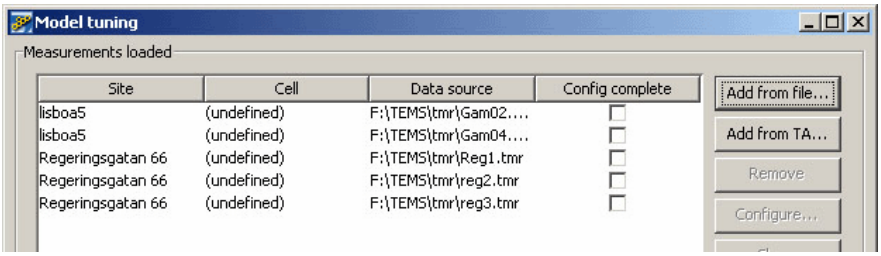
Load Files of TMR Format

Do as follows to load measurements from TMR files:

1. In the **Model tuning** window, click **Add from file**. The **Add survey file** window appears.
2. Browse to the folder with the measurement data to load and select files of type **TMR survey file (*.tmr)** as in the following example:

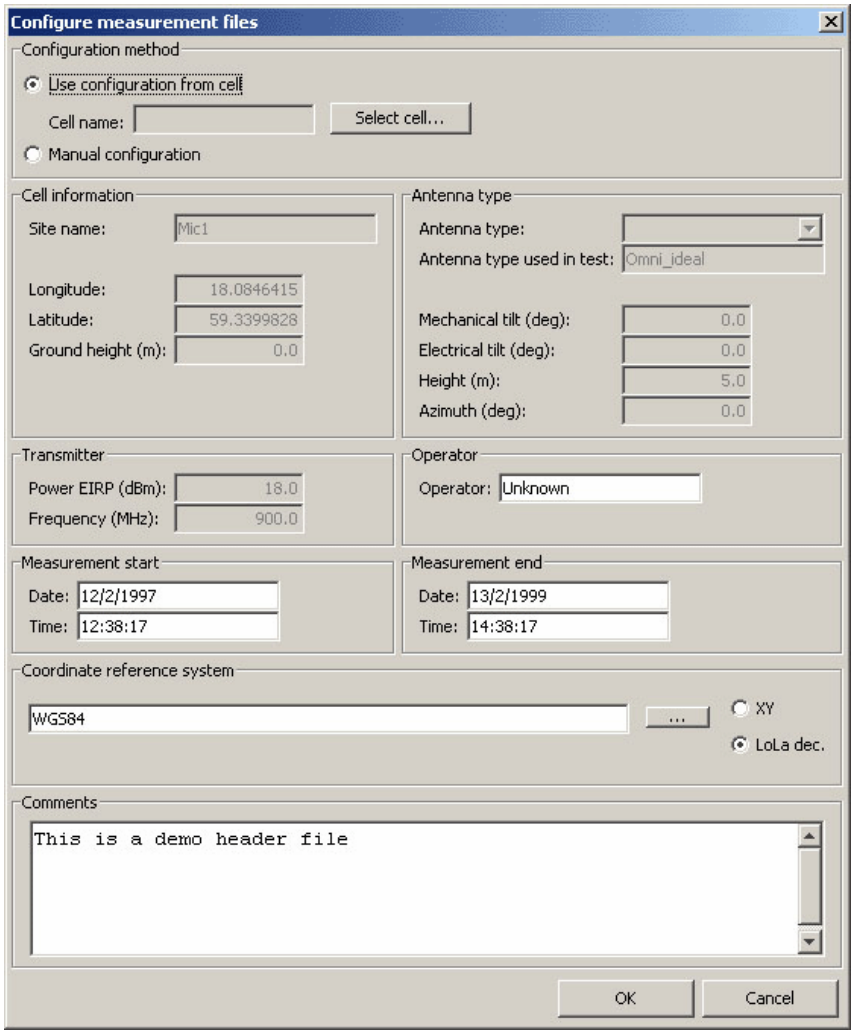


3. Select the file(s) to load and click **Open**. The **Model tuning** window is updated with the selected files as in the following example:



4. If the **Config complete** option is selected for all files, proceed to Step 11.
5. If the **Config complete** option is cleared for any file, you must add information about site position, EIRP, antenna type, height, tilt and azimuth angles not found in the imported file. Click anywhere in the row with the cleared checkbox. The **Configure** button becomes enabled.

6. Click the **Configure** button. The **Configure measurement files** window appears as in the following example:



The **Longitude** and **Latitude** parameters are of decimal lat-long format.

7. To automatically match the measurement data to your project, select **Use configuration from cell** and select the cell to match.

   To enter the data manually, select **Manual configuration** and enter appropriate values where required.

8. If needed, select another coordinate reference system, by default set to WGS84.

9. Click **OK**. The **Model tuning** window reappears.

10. If any file still has the **Config complete** option cleared, repeat from Step 5.

11. Proceed with the next procedure in the process.

Load Files of Signia Format

You load measurements from Signia files using the same procedure as Load Files of TMR Format, but now select files of type **Signia survey file (*.hd)**.

Load Files of XML Format

You load measurements from XML files using the same procedure as Load Files of TMR Format, but now select files of type **XML survey file (*.xml)**.

Regular Model Tuning: Tune 9999 Model

Use this procedure to tune a 9999 propagation model.

Prerequisites

Before tuning the propagation model, ensure that these conditions are met:

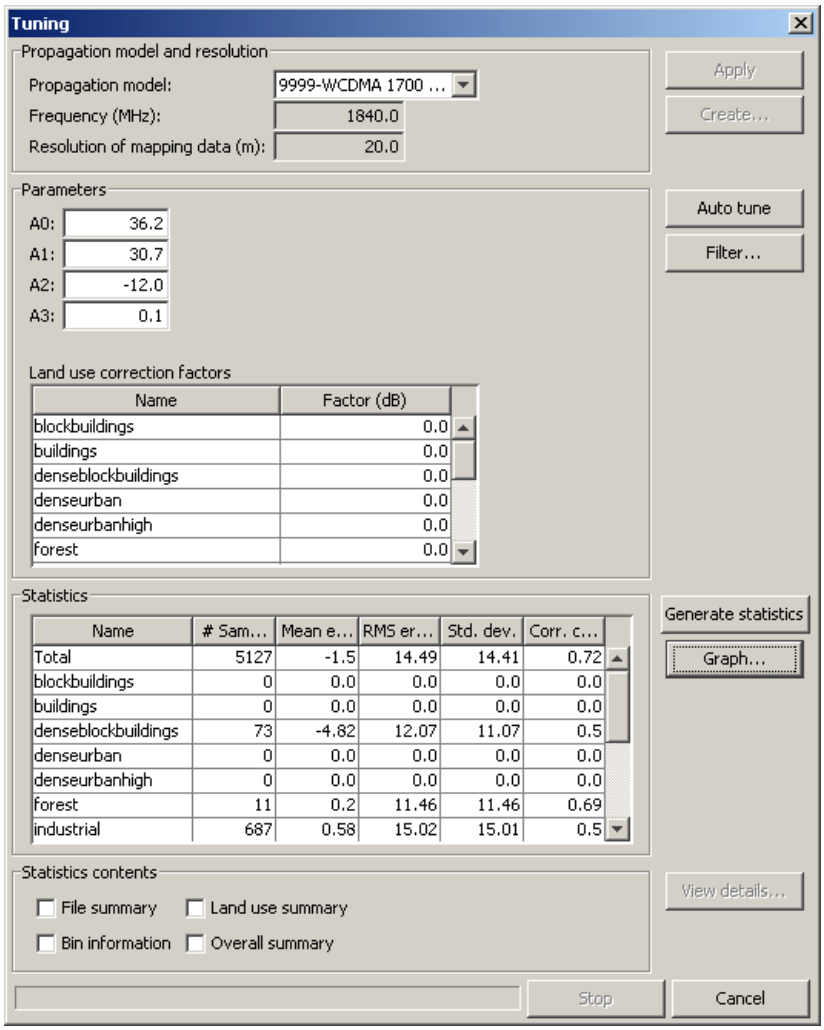
- Same as Prerequisites for Regular Model Tuning on page 14-4.
- The measurement data is imported into the open project.

Auto Tune 9999 Model

Follow these steps to auto tune 9999 model parameters:

1. In the **Model tuning** window, select the file(s) to use for tuning and click **Tune**. The **Tuning** window appears.

2. Select a 9999 model in the **Propagation model** list. All model parameters are displayed in the **Parameters** pane as in the example below. See parameter description in 9999 Model Parameters in Tuning Window:



3. Click the **Filter** button and ensure that no land use categories are excluded and that the other settings are appropriate.
4. Click **Generate statistics.** The result is presented in the **Statistics** list, with a total value presented first, then statistics per land use category. The **Auto tune** button becomes enabled.
5. Click **Auto tune**. The tuning process begins.
6. When the tuning completes, the A0, A1 and land use correction factors are updated.
7. Click **Apply** to update the model with the tuned model parameters.

Manually Tune 9999 Model

Follow these steps to manually tune 9999 model parameters:

1. In the **Model tuning** window, select the file(s) to use for tuning and click **Tune**. The **Tuning** window appears, see example in Auto Tune 9999 Model and parameter description in 9999 Model Parameters in Tuning Window.
2. Select a 9999 model in the **Propagation model** list. All model parameters are displayed in the **Parameters** pane.
3. Set land use correction factors to zero for all land use categories.
4. Click **Generate statistics.** The result is presented in the **Statistics** list, with a total value presented first, then statistics per land use category.
5. Note the mean error and RMS error/standard deviation.
6. Adjust the land use correction factors.
7. Set A1 to a new value, for example A1 = A1 + 0.2.
8. Click **Generate statistics again.** The **Statistics** list is updated.
9. Analyze the statistics in the **Statistics** list or by viewing it graphically using the **Graph** button. The mean error shall be 0 and the standard deviation as small as possible. If needed, repeat from Step 5 until the standard deviation does not decrease.
10. When the tuned propagation model is satisfactory, click **Apply** to update the model with the tuned model parameters.

9999 Model Parameters in Tuning Window

Propagation model	Propagation model for the cell.
Frequency (MHz)	Frequency used for tuning in MHz
Resolution of mapping data (m)	Resolution of map data in meters
Apply	Apply the selected propagation model
Create	Create propagation model
Parameters	Parameters for tuning: • A0 • A1 • A2 • A3
Land use correction factors	Land use categories to adjust for tuning: • Name - name of the land use category • Factor - An extra loss or gain (offset) due to effects of the near environment on the equipment
Auto tune	Use auto-tune feature
Filter	Apply filters to model
Statistics	• **Name -** Category of land use data • # Sample - Number in tuning sample • **Mean -** Predicted signal strength minus the measured signal strength averaged over the points • **RMS -** Root mean square (RMS) value for the amplifier power • **Standard deviation -** Variance of the distribution of the predicted signal strength minus the measured signal strength • **Correlation coefficient -** Correlation coefficient factor
Generate statistics	Generate statistics based on selected model
Graph	Generate graph of statistics
File summary	Include file summary in statistics
Land use summary	Include land use summary in statistics
Bin information	Include bin information in statistics
Overall summary	Include overall summary in statistics
View details	View statistics details
Stop	Stops ongoing generation of statistics or auto tuning

Regular Model Tuning: Tune Okumura-Hata Model

Use this procedure to tune the Okumura-Hata (OH) propagation model.

Prerequisites

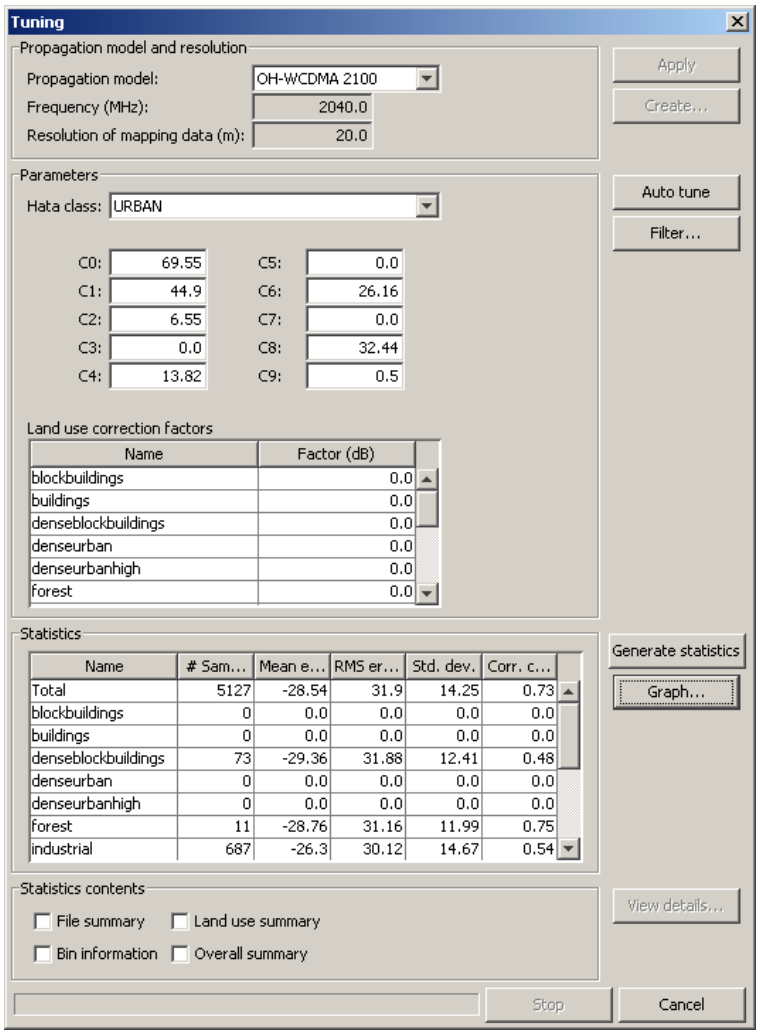
Before tuning the propagation model, ensure that these conditions are met:

- Same as Prerequisites for Regular Model Tuning on page 14-4.
- The measurement data is imported into the open project.

Auto Tune OH Model

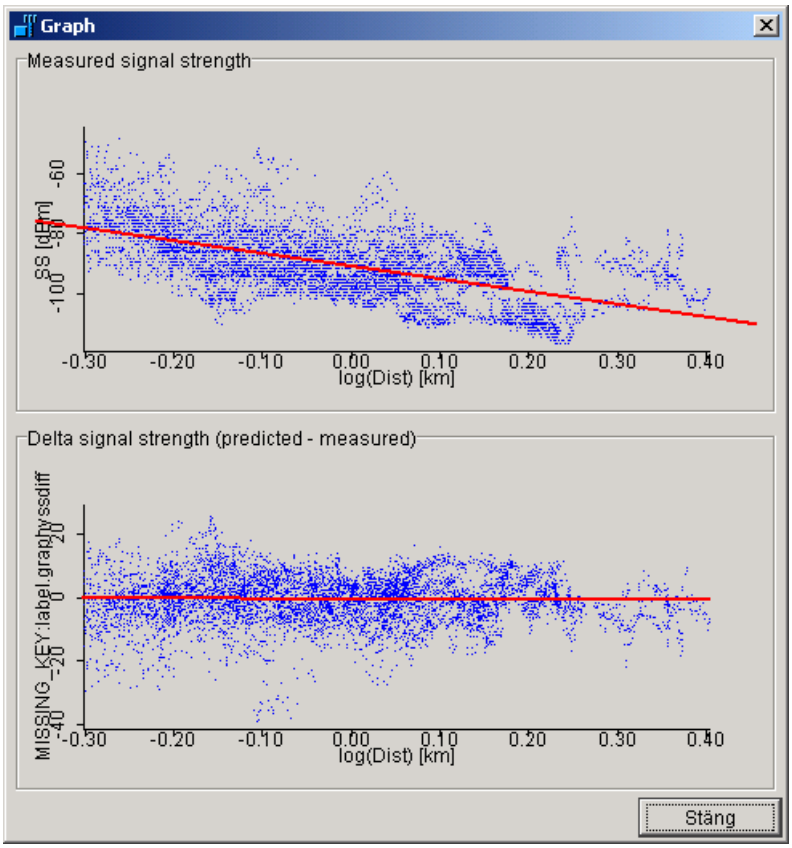
The auto tuning of the OH (Okumura-Hata) model parameters is similar to the procedure to Auto Tune 9999 Model, except that you shall select an OH model in the **Propagation model** list, and a **Hata class**.

The **Tuning** window with Okumura-Hata model parameters looks as in the example below, with parameters described in Okumura-Hata Model Parameters in Tuning Window:



Manually Tune OH Model

The manual tuning of the OH model parameters is similar to how you Manually Tune 9999 Model, except that you shall select an OH model in the **Propagation model** list, a **Hata class**, and that the model is tuned by adjusting the **C1** parameter together with the land use correction factors. The **C1** parameter value should be set such that the straight red line in the **Delta signal strength (predicted - measured)** graph is parallel to the x-axis as in the following example:



Okumura-Hata Model Parameters in Tuning Window

Propagation model	Propagation model for the cell.
Frequency (MHz)	Frequency used for tuning in MHz
Resolution of mapping data (m)	Resolution of map data in meters
Apply	Apply the selected propagation model
Create	Create propagation model
Hata class	Hata class of the OH model. Options include: • Urban • Suburban • Rural • Cost-Urban • Cost-Suburban
Parameters	Parameters for tuning: C0 - C9. See Parameter Settings for Hata Classes on page 14-16.
Land use correction factors	Land use categories to adjust for tuning: • Name - name of the land use category • Factor - An extra loss or gain (offset) due to effects of the near environment on the equipment
Auto tune	Use auto-tune feature
Filter	Apply filters to model
Statistics	• **Name -** Category of land use data • # Sample - Number in tuning sample • **Mean -** Predicted signal strength minus the measured signal strength averaged over the points • **RMS -** Root mean square (RMS) value for the amplifier power • **Standard deviation -** Variance of the distribution of the predicted signal strength minus the measured signal strength • **Correlation coefficient -** Correlation coefficient factor
Generate statistics	Generate statistics based on selected model
Graph	Generate graph of statistics
File summary	Include file summary in statistics
Land use summary	Include land use summary in statistics
Bin information	Include bin information in statistics
Overall summary	Include overall summary in statistics
View details	View statistics details
Stop	Stops ongoing generation of statistics or auto tuning

Parameter Settings for Hata Classes

Parameter	Hata Class				
	Urban	Suburban	Rural	Cost231 Urban	Cost231 Suburban
C0	69.55	59.96	28.61	49.3	46.3
C1	44.9	44.9	44.9	44.9	44.9
C2	6.55	6.55	6.55	6.55	6.55
C3	0.0	0.0	0.0	0.0	0.0
C4	13.82	13.82	13.82	13.82	13.82
C5	0.0	2.0	4.78	0.0	2.0
C6	26.16	31.95	44.49	33.9	33.9
C7	0.0	0.0	0.0	0.0	0.0
C8	32.44	32.44	32.44	32.44	32.44
C9	0.5	0.5	0.5	0.5	0.5

Regular Model Tuning: Tune Urban Model

Use this procedure to tune the Urban propagation model.

To Consider Before Tuning an Urban Model

The Urban propagation model is based on three propagation models - *Half-Screen model* used to calculate propagation above rooftops, *Recursive microcell model* used to calculate propagation along streets and finally *Building penetration model*, used to calculate propagation inside buildings. When you tune the Urban propagation model, only the half-screen part of the model may be adjusted. The building penetration part of the model can be tuned only by performing building penetration measurements. You cannot tune the recursive microcell model part of the Urban propagation model.

You will achieve the best tuning result with the most accuracy if the project uses a *high resolution three-dimensional map database containing information about building heights and locations.*

If you do not have a *building database* for a project, you can make effective adjustments to the Urban propagation model with the land use categories. If you do have a building database for a project, the system uses the screen heights from the building database and sets the positions of the screens accordingly. You should still make adjustments to land use categories, since they affect the prediction results to a lesser extent.

Prerequisites

Before tuning the propagation model, ensure that these conditions are met:

- Same as Prerequisites for Regular Model Tuning on page 14-4.

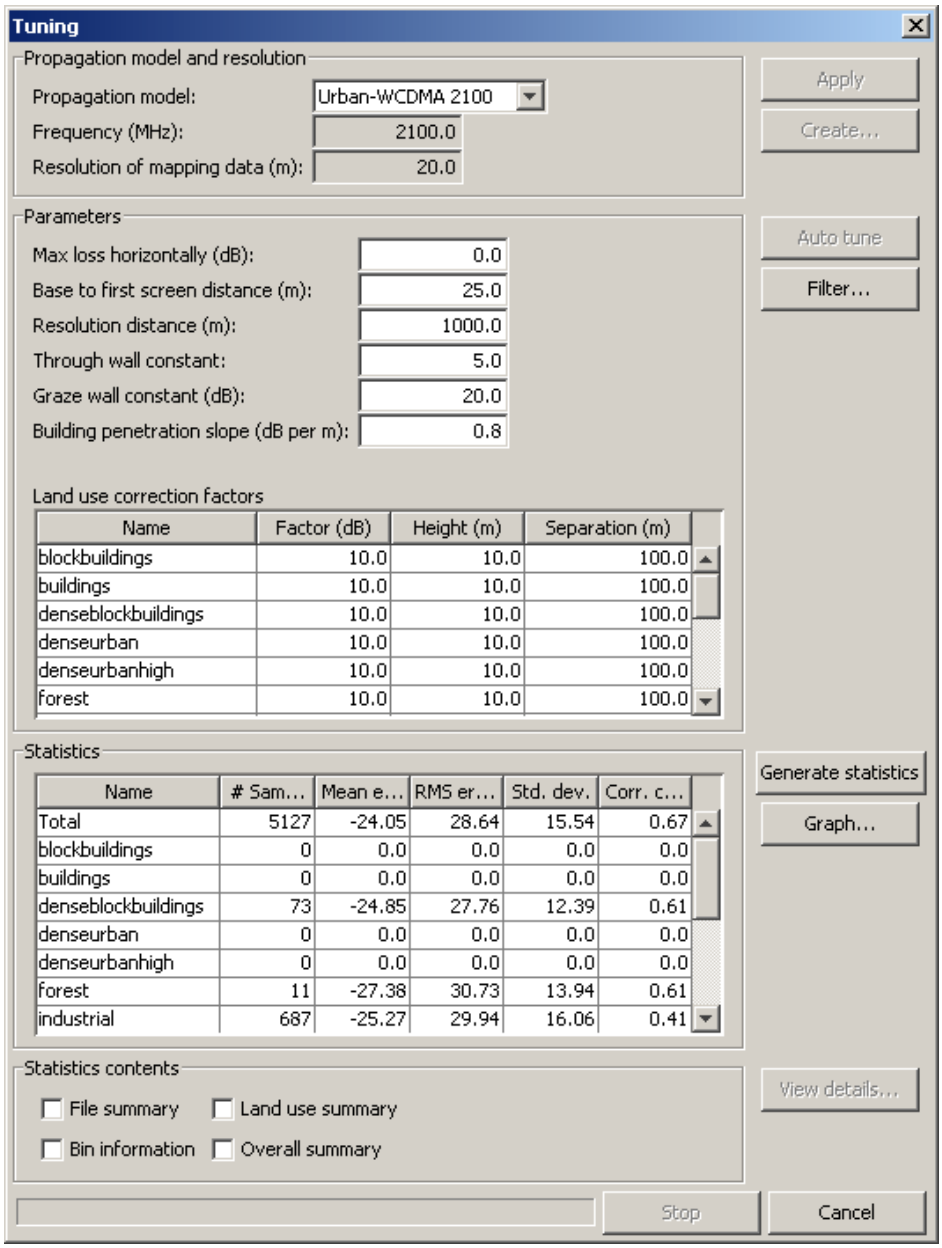
- The measurement data is imported into the open project.

Manually Tune Urban Model

Follow these steps to manually tune Urban model parameters:

1. In the **Model tuning** window, select the file(s) to use for tuning and click **Tune**. The **Tuning** window appears.

2. Select an Urban model in the **Propagation model** list. All model parameters are displayed in the **Parameters** pane. See example below and Urban Model Parameters in Tuning Window on page 14-20.


Tuning
Propagation model and resolution
Propagation model: Urban-WCDMA 2100
Frequency (MHz): 2100.0
Resolution of mapping data (m): 20.0
Apply
Create...
Parameters
Max loss horizontally (dB): 0.0
Base to first screen distance (m): 25.0
Resolution distance (m): 1000.0
Through wall constant: 5.0
Graze wall constant (dB): 20.0
Building penetration slope (dB per m): 0.8
Auto tune
Filter...
Land use correction factors
Name | Factor (dB) | Height (m) | Separation (m)
blockbuildings 10.0 10.0 100.0
buildings 10.0 10.0 100.0
denseblockbuildings 10.0 10.0 100.0
denseurban 10.0 10.0 100.0
denseurbanhigh 10.0 10.0 100.0
forest 10.0 10.0 100.0
Statistics
Name | # Sam... | Mean e... | RMS er... | Std. dev. | Corr. c...
Total 5127 -24.05 28.64 15.54 0.67
blockbuildings 0 0.0 0.0 0.0 0.0
buildings 0 0.0 0.0 0.0 0.0
denseblockbuildings 73 -24.85 27.76 12.39 0.61
denseurban 0 0.0 0.0 0.0 0.0
denseurbanhigh 0 0.0 0.0 0.0 0.0
forest 11 -27.38 30.73 13.94 0.61
industrial 687 -25.27 29.94 16.06 0.41
Generate statistics
Graph...
Statistics contents
File summary
Land use summary
Bin information
Overall summary
View details...
Stop
Cancel

3. For all land use categories, set the correction factors as follows:
   - **Factor** = 0
   - **Height** = the physical value
   - **Separation** = 100m

4. Set **Max loss horizontally** to 0 dB to disable the micro cell model.
5. Click **Generate statistics.** The result is presented in the **Statistics** list, with a total value presented first, then statistics per land use category.
6. Note the mean error and RMS error/standard deviation.
7. Adjust the land use correction factors.
8. Click **Generate statistics again.** The **Statistics** list is updated.

   Note: *If you get a message about base antenna inside a building, the building height exceeds the antenna height. This is probably caused by a* Micro-Cell Antenna Erroneously Placed Inside a Building.

9. Analyze the statistics in the **Statistics** list or by viewing it graphically using the **Graph** button. The mean error shall be 0 and the standard deviation as small as possible. If needed, repeat from Step 7 until the standard deviation does not decrease.
10. When the tuned propagation model is satisfactory, click **Apply** to update the model with the tuned model parameters.

Urban Model Parameters in Tuning Window

Propagation model	Propagation model for the cell.
Frequency (MHz)	Frequency used for model.
Resolution of mapping data (m)	Resolution of map data in meters. Value can be changed only by modifying the propagation model.
Apply	Apply the selected propagation model
Create	Create propagation model
Max loss horizontally (dB)	Determines the maximum pathloss calculated by the recursive microcell model. Set to 0 to turn off the recursive microcell model. Set values from 100 to 200 to turn on the recursive microcell model.
Base to first screen distance (m)	Determines the distance between the base antenna and the first screen. Used to reduce the half-screen component when modeling microcells. Has small effect in the tuning process. Default = 25.
Resolution distance (m)	Should not be adjusted for tuning purposes. Determines the resolution of the prediction with the Half-screen model. Normally this is half the value of the prediction radius.
Through wall constant	Determines building penetration loss through the wall, used for the building penetration model. Range = 5-10. Default = 5.
Graze wall constant (dB)	Determines the extra wall loss at a small grazing angle. Used for the building penetration model. Default = 20.
Building penetration slope (dB per m)	Defines the rate at which the signal decreases inside a building. Used for the building penetration model. Range: 0.3 - 1.0.
Land use correction factors	Correction factors for land use categories. **Important parameters for tuning.** • Factor (dB) - An extra loss or gain (offset) due to effects of the near environment on the equipment • Height (m) - The height of the obstacles associated with the land use category. The value must match the actual value of the physical land use. • Separation - The distance between screens. Has small effect in the tuning process. Range: 80m - 120m. Default = 100m.
Auto tune	Use auto-tune feature. Not applicable for Urban model.
Filter	Apply filters to model

Statistics	• **Name -** Category of land use data • # Sample - Number in tuning sample • **Mean -** Predicted signal strength minus the measured signal strength averaged over the points • **RMS -** Root mean square (RMS) value for the amplifier power • **Standard deviation -** Variance of the distribution of the predicted signal strength minus the measured signal strength • **Correlation coefficient -** Correlation coefficient factor
Generate statistics	Generate statistics based on selected model
Graph	Generate graph of statistics
File summary	Include file summary in statistics
Land use summary	Include land use summary in statistics
Bin information	Include bin information in statistics
Overall summary	Include overall summary in statistics
View details	View statistics details
Stop	Stops ongoing generation of statistics or auto tuning

Micro-Cell Antenna Erroneously Placed Inside a Building

If you get the message **Base antenna inside a building** when generating statistics, the building height exceeds the antenna height. This is not supported by the Urban model algorithm.

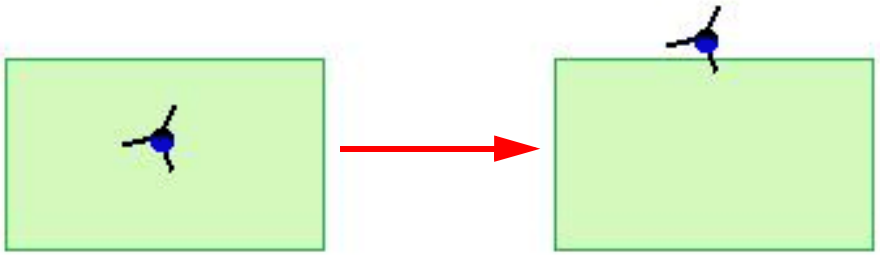
The reason might be that a wall-attached low-height micro-cell antenna is erroneously placed inside a building in the network plan, probably due to minor coordinate errors.

There are two proposed solutions to this problem:

a. Move out the antenna to its real position just outside the building as described in the figure below, or

b. Rise the antenna height over the building height

The unaccepted antenna position is given in the message.



antenna inside building,
not accepted by Urban model

antenna outside building,
valid for Urban model

Regular Model Tuning: Tune Walfisch-Ikegami Model

Use this procedure to tune the Walfisch-Ikegami (WI) propagation model.

Prerequisites

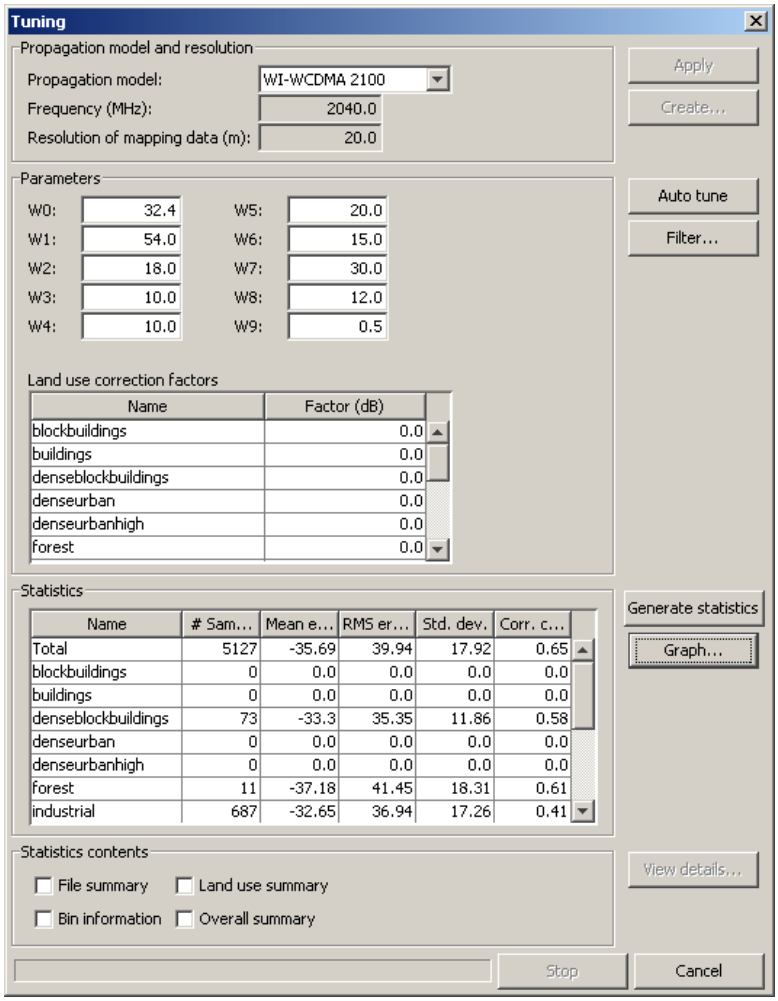
Before tuning the propagation model, ensure that these conditions are met:

- Same as Prerequisites for Regular Model Tuning on page 14-4.
- The measurement data is imported into the open project.

Auto Tune WI Model

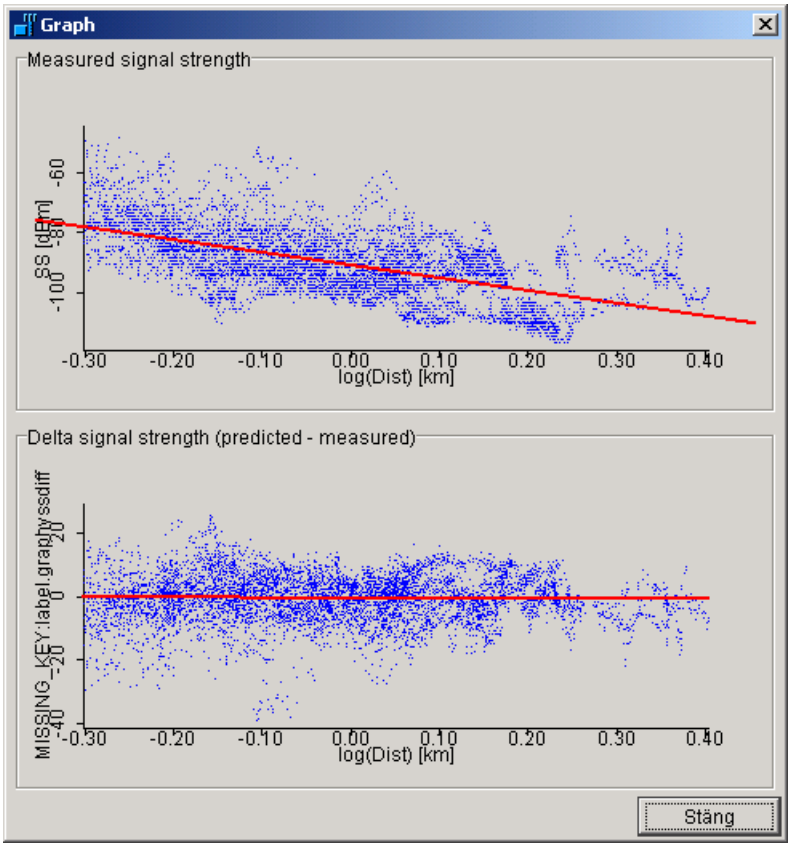
The auto tuning of the WI model parameters is similar to how you Auto Tune 9999 Model, except that you shall select a WI model in the **Propagation model** list.

The **Tuning** window with Walfisch-Ikegami parameters looks as in the example below. See Walfisch-Ikegami Model Parameters in Tuning Window on page 14-24.



Manually Tune WI Model

The manual tuning of the OH model parameters is similar to how you Manually Tune 9999 Model, except that you shall select a WI model in the **Propagation model** list, and that the model is tuned by adjusting the **W2** parameter together with **W1** parameter. The **W2** parameter value should be set such that the straight red line in the **Delta signal strength (predicted - measured)** graph is parallel to the x-axis as in the following example:



Walfisch-Ikegami Model Parameters in Tuning Window

Propagation model	Propagation model for the cell.
Frequency (MHz)	Frequency used for tuning in MHz
Resolution of mapping data (m)	Resolution of map data in meters
Apply	Apply the selected propagation model
Create	Create propagation model
Parameters	Parameters for tuning: • W0 - Free space loss correction. Range: 20 – 60. Default = 32.4 • W1 - Reduced base antenna height correction. Range: 30 – 70. Default = 54 • W2 - Range correction. Range: 5 – 35. Default = 10 • W3 - Street width correction. Range: 3 – 15. Default = 10 • W4 - Frequency correction. Range: 3 – 25. Default = 10 • W5 - Building height correction. Range: 10 – 30. Default = 20 • W6 - Street width 15 m. • W7 - Distance between buildings 30 m. • W8 - Building height 12 m. • W9 - Knife edge diffraction loss correction. Range = 0 – 1. Default = 0.5
Land use correction factors	Land use categories to adjust for tuning: • Name - name of the land use category • Factor - An extra loss or gain (offset) due to effects of the near environment on the equipment
Auto tune	Use auto-tune feature
Filter	Apply filters to model
Statistics	• **Name -** Category of land use data • # Sample - Number in tuning sample • **Mean -** Predicted signal strength minus the measured signal strength averaged over the points • **RMS -** Root mean square (RMS) value for the amplifier power • **Standard deviation -** Variance of the distribution of the predicted signal strength minus the measured signal strength • **Correlation coefficient -** Correlation coefficient factor
Generate statistics	Generate statistics based on selected model
Graph	Generate graph of statistics
File summary	Include file summary in statistics
Land use summary	Include land use summary in statistics
Bin information	Include bin information in statistics

Overall summary	Include overall summary in statistics
View details	View statistics details
Stop	Stops ongoing generation of statistics or auto tuning

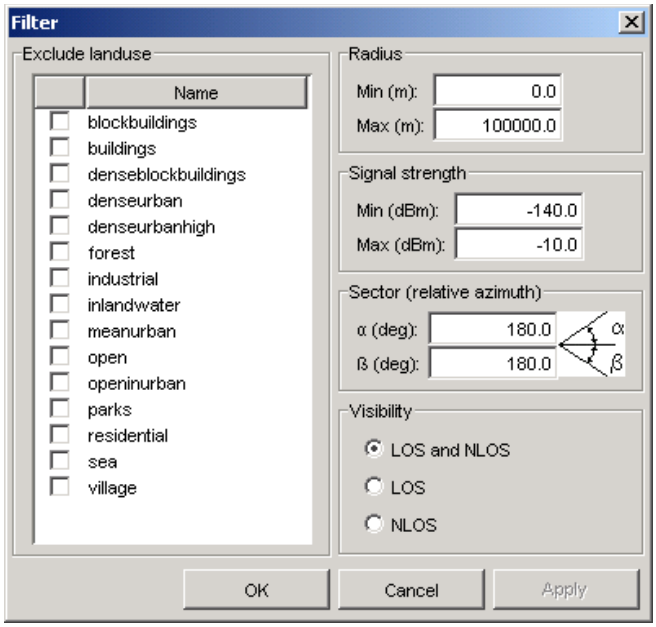
Regular Model Tuning: Filter Measurement Data

Use this procedure to apply filters on drive test measurement data. Using filters, you can exclude undesirable measurement points that might skew the data. You can focus on the most meaningful points for tuning the propagation model.

Procedure

Follow these steps to apply filters to drive test measurement data:

1. In the Tuning window, click Filter…. The Filter window appears as in the following example:



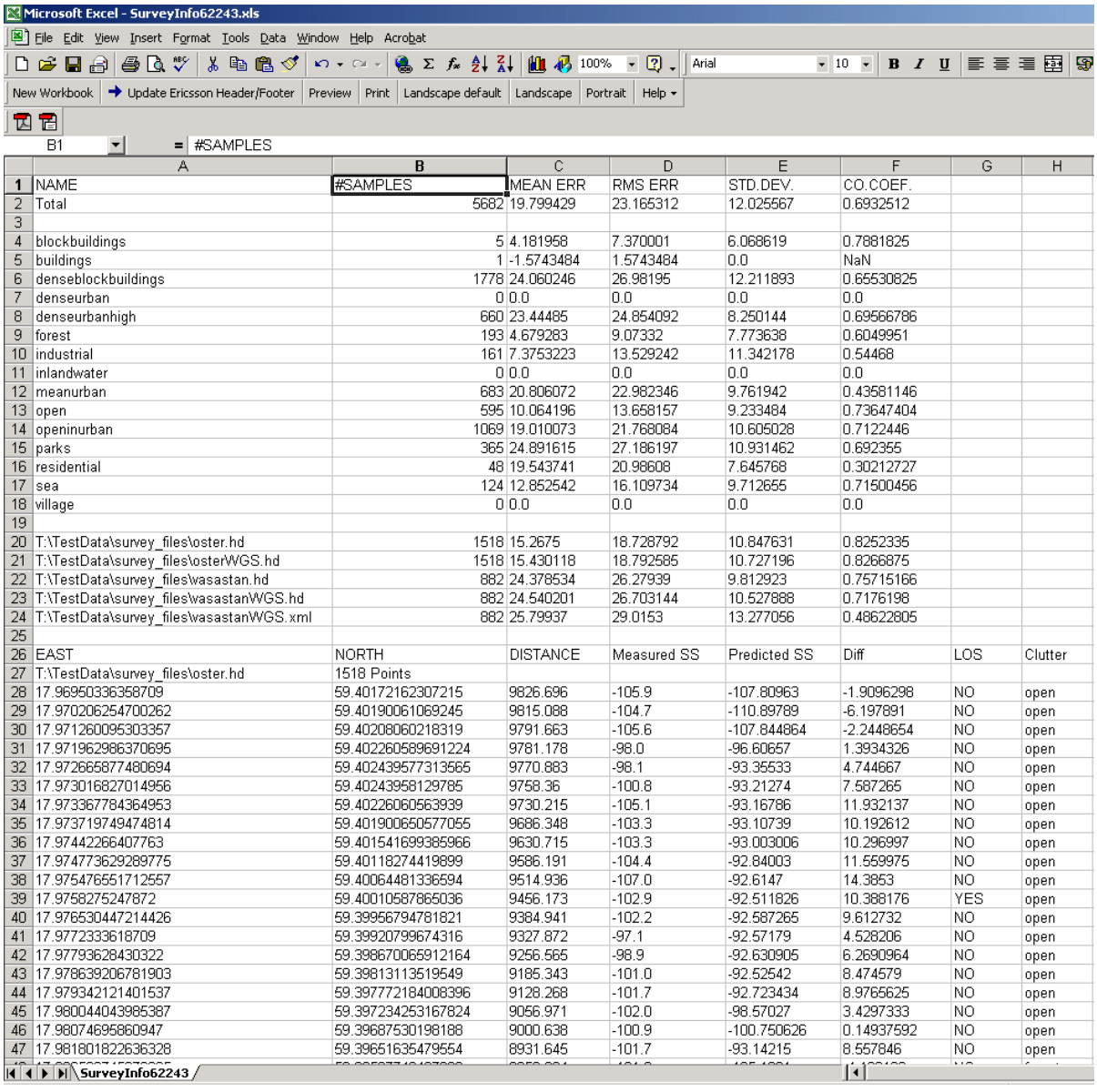
2. Select the filters to apply to the measurement analysis data.
3. Click OK.

Fields on Window “Filters”

Exclude land use	Excludes measurement points on certain land use types. The total measurement points per land use is shown to the right of each land use type. As a guideline, include land use consistent with the other criteria selected.
Radius	Selects measurement points within a certain distance interval from a transmitter site, specified by the minimum and maximum distances from the cell in meters.
Signal strength	Selects measurement points within a certain received signal strength interval, specified by the minimum and maximum strength in dBm.
Sector	Specifies the angle in degrees within each cell, calculated clockwise, of the data points to consider.
Visibility	Selects measurement points relative to the transmitter antenna: • Line of sight (LOS) • Not line of sight (NLOS) • Both (LOS and NLOS)

Regular Model Tuning: View Tuning Statistics Details

To obtain detailed information about the statistics generated, click **View details** in the **Tuning** window. The contents are displayed in Microsoft Excel®.



Microsoft Excel - SurveyInfo62243.xls

File Edit View Insert Format Tools Data Window Help Acrobat

New Workbook | Update Ericsson Header/Footer | Preview | Print | Landscape default | Landscape | Portrait | Help

B1 = #SAMPLES

	A	B	C	D	E	F	G	H
1	NAME	#SAMPLES	MEAN ERR	RMS ERR	STD.DEV.	CO.COEF.		
2	Total	5682	19.799429	23.165312	12.025567	0.6932512		
3								
4	blockbuildings	5	4.181958	7.370001	6.068619	0.7881825		
5	buildings	1	-1.5743484	1.5743484	0.0	NaN		
6	denseblockbuildings	1778	24.060246	26.98195	12.211893	0.65530825		
7	denseurban	0	0.0	0.0	0.0	0.0		
8	denseurbanhigh	660	23.44485	24.854092	8.250144	0.69566786		
9	forest	193	4.679283	9.07332	7.773638	0.6049951		
10	industrial	161	7.3753223	13.529242	11.342178	0.54468		
11	inlandwater	0	0.0	0.0	0.0	0.0		
12	meanurban	683	20.806072	22.982346	9.761942	0.43581146		
13	open	595	10.064196	13.658157	9.233484	0.73647404		
14	openinurban	1069	19.010073	21.768084	10.605028	0.7122446		
15	parks	365	24.891615	27.186197	10.931462	0.692355		
16	residential	48	19.543741	20.98608	7.645768	0.30212727		
17	sea	124	12.852542	16.109734	9.712655	0.71500456		
18	village	0	0.0	0.0	0.0	0.0		
19								
20	T:\TestData\survey_files\oster.hd	1518	15.2675	18.728792	10.847631	0.8252335		
21	T:\TestData\survey_files\osterWGS.hd	1518	15.430118	18.792585	10.727196	0.8266875		
22	T:\TestData\survey_files\wasastan.hd	882	24.378534	26.27939	9.812923	0.75715166		
23	T:\TestData\survey_files\wasastanWGS.hd	882	24.540201	26.703144	10.527888	0.7176198		
24	T:\TestData\survey_files\wasastanWGS.xml	882	25.79937	29.0153	13.277056	0.48622805		
25								
26	EAST	NORTH	DISTANCE	Measured SS	Predicted SS	Diff	LOS	Clutter
27	T:\TestData\survey_files\oster.hd	1518 Points						
28	17.96950336358709	59.40172162307215	9826.696	-105.9	-107.80963	-1.9096298	NO	open
29	17.970206254700262	59.40190061069245	9815.088	-104.7	-110.89789	-6.197891	NO	open
30	17.971260095303357	59.40208060218319	9791.663	-105.6	-107.844864	-2.2448654	NO	open
31	17.971962986370695	59.402260589691224	9781.178	-98.0	-96.60657	1.3934326	NO	open
32	17.972665877480694	59.402439577313565	9770.883	-98.1	-93.35533	4.744667	NO	open
33	17.973016827014956	59.40243958129785	9758.36	-100.8	-93.21274	7.587265	NO	open
34	17.973367784364953	59.40226060563939	9730.215	-105.1	-93.16786	11.932137	NO	open
35	17.973719749474814	59.401900650577055	9686.348	-103.3	-93.10739	10.192612	NO	open
36	17.97442266407763	59.401541699385966	9630.715	-103.3	-93.003006	10.296997	NO	open
37	17.974773629289775	59.40118274419899	9586.191	-104.4	-92.84003	11.559975	NO	open
38	17.975476551712557	59.40064481336594	9514.936	-107.0	-92.6147	14.3853	NO	open
39	17.9758275247872	59.40010587865036	9456.173	-102.9	-92.511826	10.388176	YES	open
40	17.976530447214426	59.39956794781821	9384.941	-102.2	-92.587265	9.612732	NO	open
41	17.9772333618709	59.39920799674316	9327.872	-97.1	-92.57179	4.528206	NO	open
42	17.97793628430322	59.398670065912164	9256.565	-98.9	-92.630905	6.2690964	NO	open
43	17.978639206781903	59.39813113519549	9185.343	-101.0	-92.52542	8.474579	NO	open
44	17.979342121401537	59.397772184008396	9128.268	-101.7	-92.723434	8.9765625	NO	open
45	17.980044043985387	59.397234253167824	9056.971	-102.0	-98.57027	3.4297333	NO	open
46	17.98074695860947	59.39687530198188	9000.638	-100.9	-100.750626	0.14937592	NO	open
47	17.981801822636328	59.39651635479554	8931.645	-101.7	-93.14215	8.557846	NO	open

SurveyInfo62243

Contents of Statistics Details

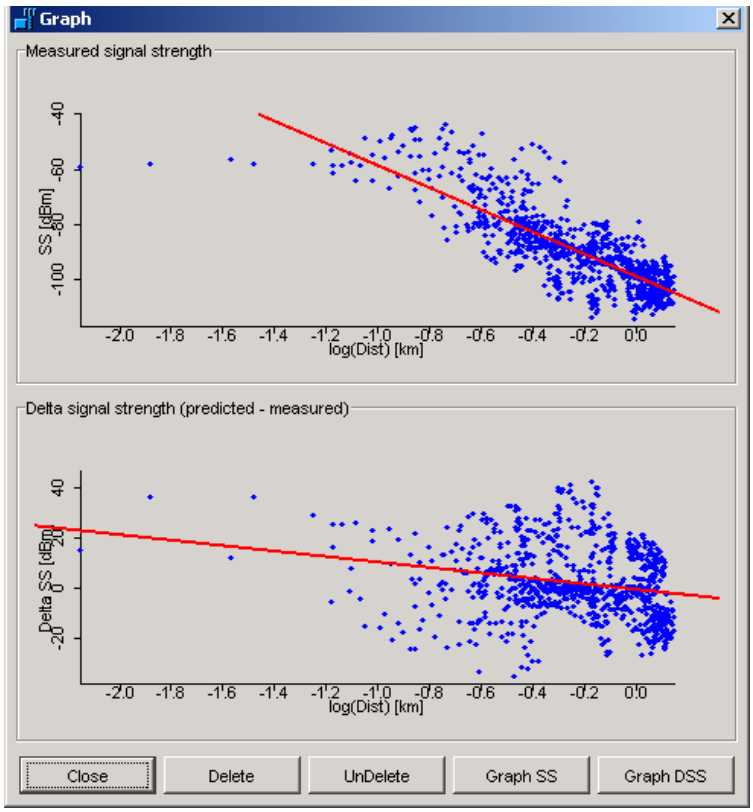
The statistics reports contain the following information:

Statistics	Contents
File summary	File name, cell name within the file, number of bins, and mean error.
Bin information	Measured signal strength, predicted signal strength, and signal error for each bin.
Overall summary	Number of bins, overall mean error, mean RMS error, standard deviation, correlation coefficient, and tuned parameters.
Land use summary	Numbers of bins, mean error, mean RMS error, standard deviation, and correlation coefficient for each land use type.

Regular Model Tuning: Display Prediction Graphs

You can generate reports and graphs before or after tuning based on the parameters in the **model parameters** list.

To display graphs for measured and predicted signal strength, click **Graph**. The **Graph** window displays a graph as in the example below. The graph uses the parameters in the **Model parameters** list.

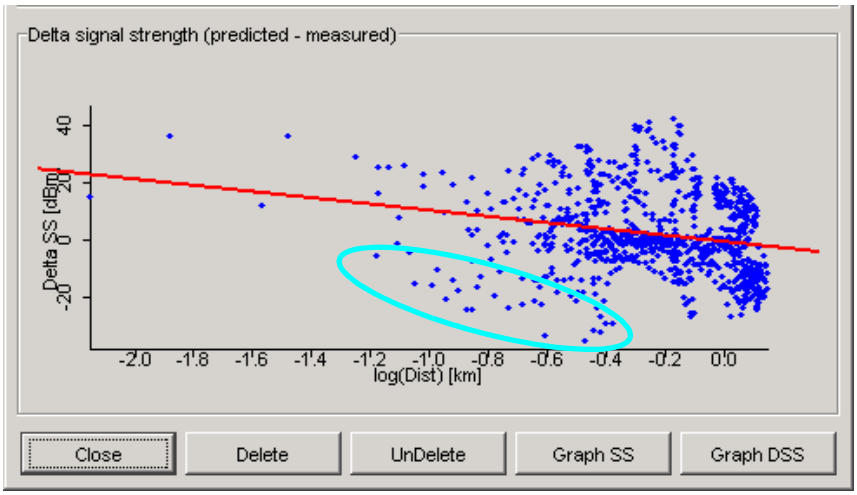


Fields on Window "Graph"

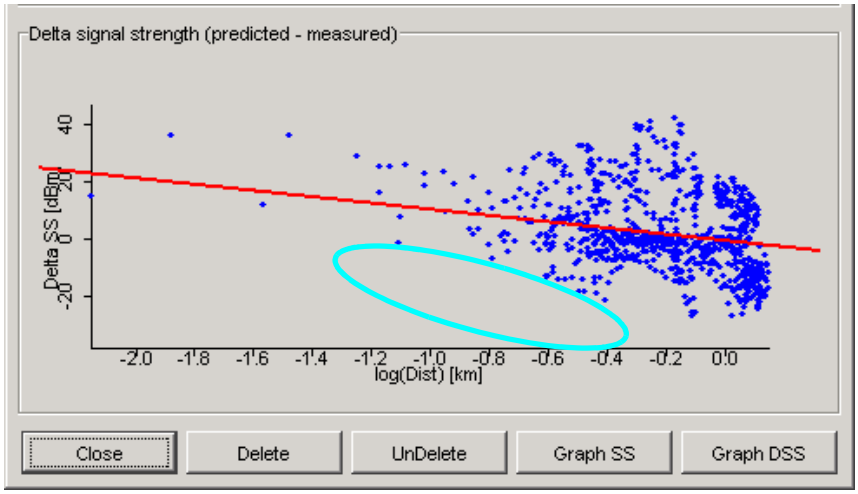
Measured signal strength	Signal strength vs. logarithmic distance (km)
Delta signal strength	Signal strength difference vs. logarithmic distance (km)
Close	Closes the Graph display.
Delete	Deletes measurement points from the graph, see Regular Model Tuning: Delete Points from Prediction Graphs
UnDelete	Undeletes measurement points from the graph
Graph SS	Displays the Chart Properties window for adjusting display colors and symbols
Graph DSS	Displays the Chart Properties window for adjusting display colors and symbols

Regular Model Tuning: Delete Points from Prediction Graphs

You can delete measurement points from the graph by left-click (or SHIFT left-click for multiple selection) on the point(s) and click the **Delete** button. The example below first shows all measurement points before deletion:



After deletion, the graph looks as follows:



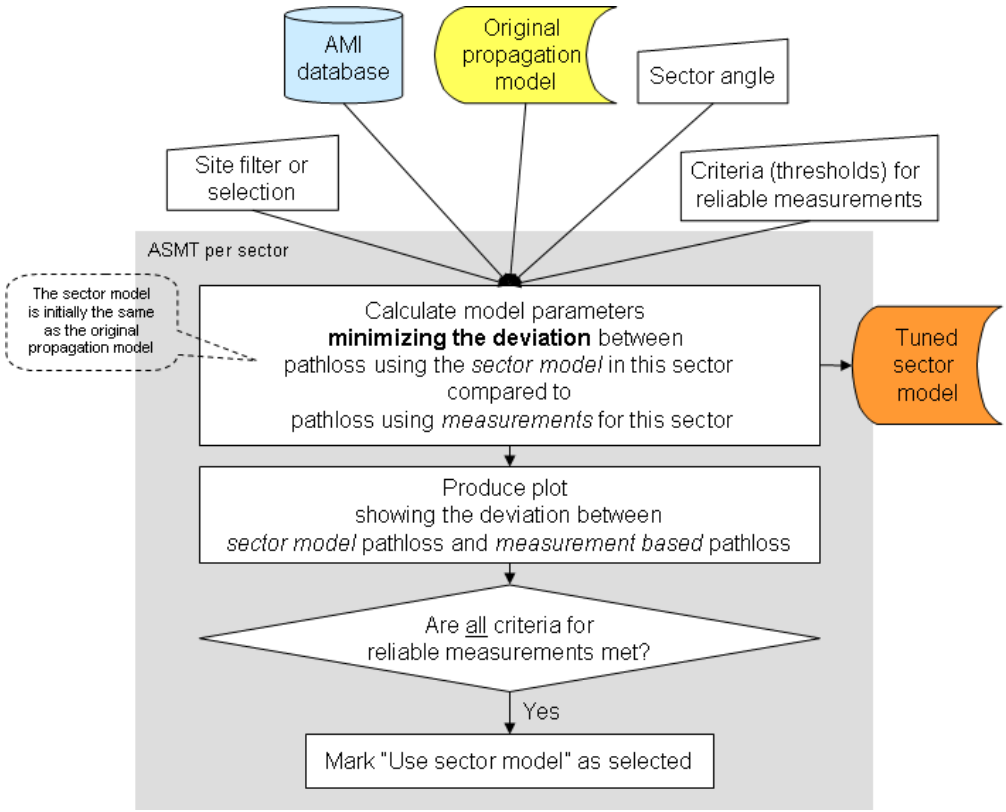
You can undo your changes be clicking the **UnDelete** button.

Automatic Sector Model Tuning (ASMT)

Automatic Sector Model Tuning (ASMT) creates sector wise propagation models by using measurement data from the AMI database, see Automatic Measurement Integration (AMI) on page 13-1.

By using the optimized sector models produced by ASMT, you obtain a higher accuracy in the TEMS CellPlanner Functions Using Sector Models.

The flow chart below shows how ASMT produces its results and the input needed:


AMI database
Original propagation model
Sector angle
Site filter or selection
Criteria (thresholds) for reliable measurements
ASMT per sector
The sector model is initially the same as the original propagation model
Calculate model parameters **minimizing the deviation** between pathloss using the *sector model* in this sector compared to pathloss using *measurements* for this sector
Tuned sector model
Produce plot showing the deviation between *sector model* pathloss and *measurement based* pathloss
Are all criteria for reliable measurements met?
Yes
Mark "Use sector model" as selected

ASMT takes the original propagation model (which is recommended to be already tuned by Regular Model Tuning) and measurements from the AMI database as input. For each sector with measurements in the AMI database, ASMT creates a sector model based on the original model. ASMT automatically optimizes the sector model parameters and calculates the pathloss using the new model. The pathloss obtained with the sector model is compared to the measured pathloss in the AMI database. This is iterated until the optimal model parameters are found, that is, the parameters giving the least difference between the sector model pathloss and the measured pathloss.

For each sector, ASMT presents the standard deviation and mean error between the sector model pathloss and the measured pathloss. There is also a check box allowing you to select or reject use of the sector model. If selected, the TEMS CellPlanner Functions Using Sector Models replaces the original propagation model with the sector model in that sector. The sector model is automatically selected if the measurements of the sector meet requirements on reliability defined by thresholds. You can modify these thresholds, such as minimum number of measured bins, maximum allowed deviation from the measured pathloss and so on.

ASMT also plots the drive test route related to a selected cell. The plot shows the difference between the sector model pathloss and the measured pathloss.

TEMS CellPlanner Functions Using Sector Models

The following functions, described in the *TEMS CellPlanner WCDMA User's Guide*, can use the sector models produced by using ASMT:

- Network Analysis
- Automatic Cell Planning (ACP)

Tune Sector Models

Use this procedure to create sector models tuned to give a pathloss as close as possible from the measured pathloss in the AMI database.

Read Automatic Sector Model Tuning (ASMT) on page 14-31 for further information.

Prerequisites

Before tuning sector models, ensure the following conditions are met:

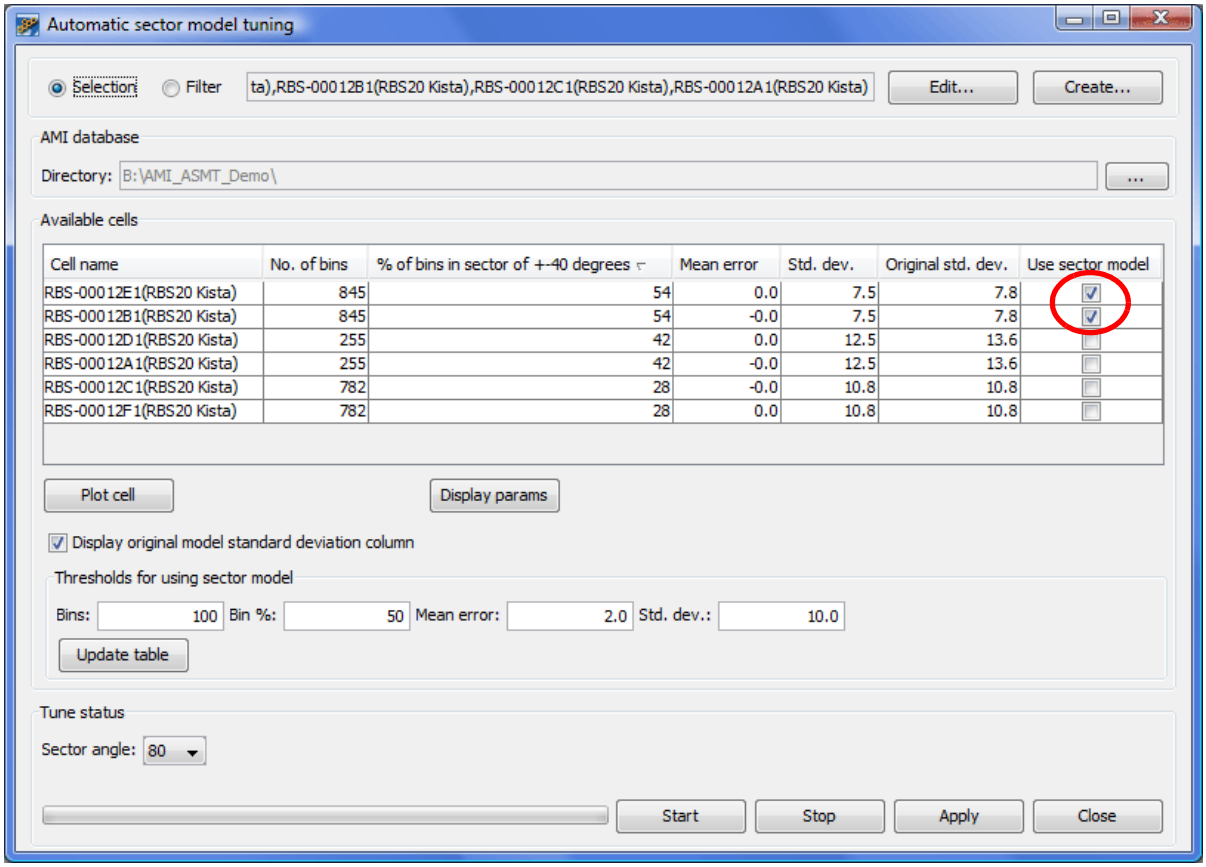
- An AMI database is created, see Create AMI Database on page 13-6.
- Measurements are imported into the AMI database, see Import Measurements into AMI Database on page 13-8.
- A project is open, and its cell configuration is the same as in the Live Network where the measurements are captured.
- The propagation model to tune is defined for the antenna branches of the sectors where the model shall be tuned.
- You have access to a valid ASMT license.

Procedure

Follow these steps to tune sector models:

1. Select **File↗User settings** to open the **User settings** window.

2. Enter the **AMI database directory** and click **OK**.
3. Select **Utilities↗Automatic sector model tuning.** A window with the same name is opened.
4. From the **Selection & filters** panel, select the sites whose sectors to include in the tuning.
5. Enter the **Threshold** values.
6. Click **Start**. The sector models are created and displayed in the list of Available cells as in the example below. The option **Use sector model** is automatically selected for the sectors where the tuned sector model meets the threshold requirements. See Fields on Window "Automatic sector model tuning" on page 14-35.



7. You can modify the results from the first tuning in a number of ways:
   - *Tune with other thresholds*: Modify threshold values and click **Update table**. The table with Available cells is updated.
   - *Tune with other sector angle*: Modify the sector angle value and click **Start**. The table with Available cells is updated.

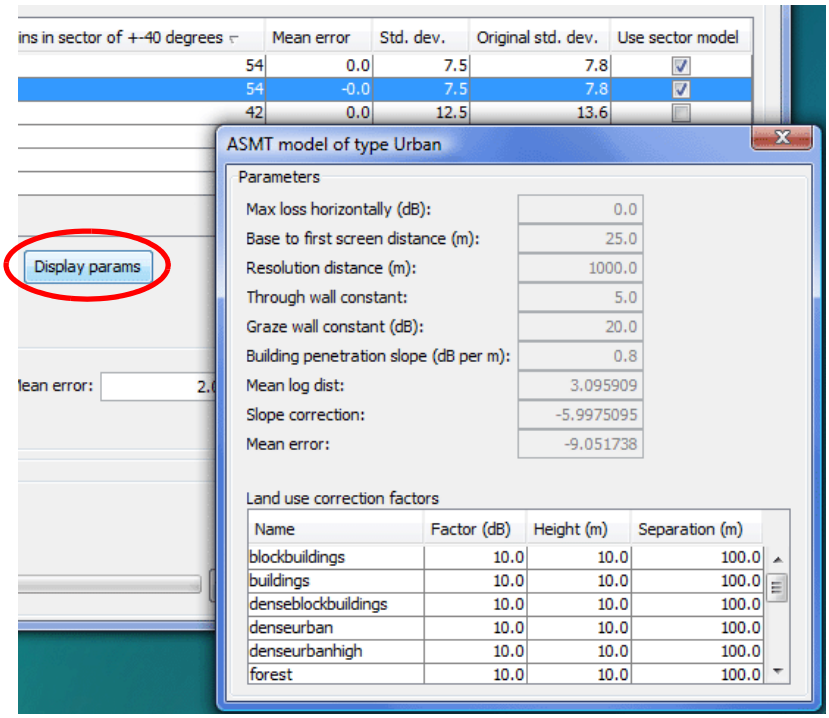
- *Override threshold based selection of sector models*: Use the **Use sector model** option to select or deselect the use of sector models.

8. You can view the results in various ways:

   - *Compare std dev of sector model and original model*:
     Normally only the standard deviation using the sector model is displayed. Select option **Update original model standard deviation column**. An extra column showing the std dev obtained with the original propagation model appears in the table of Available cells.

   - *Compare measured and predicted pathloss graphically*:
     Select a cell from the list and click **Plot cell**. A plot shows the difference between measured pathloss and predicted pathloss, the latter using the sector model.

   - *Display model parameters of a sector*:
     For the Urban and 9999 models, you can display the model parameters. Select the sector in the list of Available cells, and click **Display params**. The window **ASMT model of type xxx** appears:


ins in sector of +-40 degrees
Mean error
Std. dev.
Original std. dev.
Use sector model
54 0.0 7.5 7.8
54 -0.0 7.5 7.8
42 0.0 12.5 13.6
Display params
lean error:
ASMT model of type Urban
Parameters
Max loss horizontally (dB): 0.0
Base to first screen distance (m): 25.0
Resolution distance (m): 1000.0
Through wall constant: 5.0
Graze wall constant (dB): 20.0
Building penetration slope (dB per m): 0.8
Mean log dist: 3.095909
Slope correction: -5.9975095
Mean error: -9.051738
Land use correction factors
Name Factor (dB) Height (m) Separation (m)
blockbuildings 10.0 10.0 100.0
buildings 10.0 10.0 100.0
denseblockbuildings 10.0 10.0 100.0
denseurban 10.0 10.0 100.0
denseurbanhigh 10.0 10.0 100.0
forest 10.0 10.0 100.0

9. Click **Apply** to store the tuning results in the project.

10. Optional: Open the **Site explorer** and verify that the antenna branches of the cells with applied sector models now have the option **Sector model** selected.

Note: *The sector models are not included in the list of propagation models in the **System explorer**. You can only see them in the **Site explorer**.*

Fields on Window "Automatic sector model tuning"

AMI database	Path to directory containing the AMI database with measurement data. For information on how to update the AMI database with measurement data, see Import Measurements into AMI Database on page 13-8.
Available cells	Table of sectors for which sector models are created, including the following columns: • Cell name - Name of the sector • No. of bins - The number of bins in this cell with measurements in the AMI database • % of bins in sector of +- x degrees Of all bins in this cell with measurements in the AMI database, this is the percentage within the specified sector angle within the prediction radius of the cell. x = sector angle / 2. • Mean error - The difference in dB between pathloss with sector model and measured pathloss. Calculated according to formula (measured pathloss - predicted pathloss using the *sector model*) / (number of measurement samples). • Std. dev. - The standard deviation of the measured pathloss compared to the predicted pathloss using the *sector model*. Indicates how much measurements are spread around the mean error. • Original std. dev. - Displayed if **Display original model standard deviation column** is selected. The standard deviation of the measured pathloss compared to the predicted pathloss using the *original propagation model*. Indicates how much measurements are spread around the mean error. • Use sector model - If selected, the tuned sector model instead of the original propagation model will be used when any of the TEMS CellPlanner Functions Using Sector Models analyzes the cell. If selected by default, you can clear it manually. See **Thresholds for using sector model**.
Plot cell	Plots the measurement points relevant for the selected cell, with each point color coded to show the difference between the sector model pathloss and the measured pathloss. The value of the difference is displayed on the status bar.
Display params	Displays the model parameters of the selected sector. Valid for sectors tuned from an Urban or 9999 propagation model.
Display original model standard deviation column	Indicates that the standard deviation for the original propagation model will be calculated and displayed in a column in the table of **Available cells**. The calculation may take some time. If not selected, the column in the table is not displayed at all.

Thresholds for using sector model	User defined thresholds to determine if the sector models are close enough to reality, based on measurements. The sector models fulfilling these criteria are selected by default, see **Use sector model**. The actual values of the limited parameters are displayed in the columns in the table of **Available cells**. • Bins - At least this number of bins must have measured values in the cell. Default = 100. • Bin % - At least this percentage of the measured values (see **Bins**) must have been captured within the specified **Sector angle**. Default = 50%. • Mean error - Maximum mean error in dB. Default = 2. • Std. dev - Maximum standard deviation. Default = 10.
Update table	Updates the **Available cells** table with new thresholds
Sector angle	The value of the angle based on the antenna azimuth used for the threshold **Bin %**. Determines the percentage of bins within the cell coverage area. Default = 80 degrees, that is +/- 40 degrees.
Start	Starts the sector model tuning process
Stop	Stops the sector model tuning process
Apply	Applies the selected sector models to be used instead of the original propagation model.

15
Working with Projects on Server

This chapter describes how to work with projects stored in database, accessed via the TEMS CellPlanner Server.

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About Projects on Server

TEMS CellPlanner projects may be stored in a database. Several projects can be stored in the same database and shared by multiple users.

Server vs Database

As a TEMS CellPlanner Client user you do not have direct access to the database. When accessing projects in database, the TEMS CellPlanner Client communicates with the TEMS CellPlanner Server, which in its turn acts as a client towards the database. The TEMS CellPlanner Server conveys the data between TEMS CellPlanner Clients and the database and performs conflict resolution of projects shared by multiple users.

The conventions in this chapter are simplified such that operations like "Create project on server", "Load workspace from server" indicate that a project is physically stored on the database server, but you access it through the TEMS CellPlanner Server. You only need to know that projects are stored "on the server" without knowing the physical location of the database.

The TEMS CellPlanner Server is a common name for any of the following:

- Zero Admin Server, creates a proprietary low-cost database
- Enterprise Server, installed together with an Oracle database

As an end-user you normally only need to know that you perform operations towards the database via a TEMS CellPlanner Server. Some operations are however different depending on server type. You should therefore ask your administrator which server type is used so you know how to interpret parameters and symbols in the publish and refresh windows.

You can read more about TEMS CellPlanner Servers in the *TEMS CellPlanner Installation Guide,* chapter *TEMS CellPlanner Servers for Shared Projects*.

Permissions

TEMS CellPlanner provides an administration tool for defining users and user groups, and setting permissions for projects, system objects, and sites. User groups can have read, create, modify, and delete permissions. See Administering Users and Projects on Server, 16-1 for more information on this topic.

Performance

TEMS CellPlanner is implemented for optimal performance when working with projects on server:

- Dynamic load with caching achieves scalability and good performance.

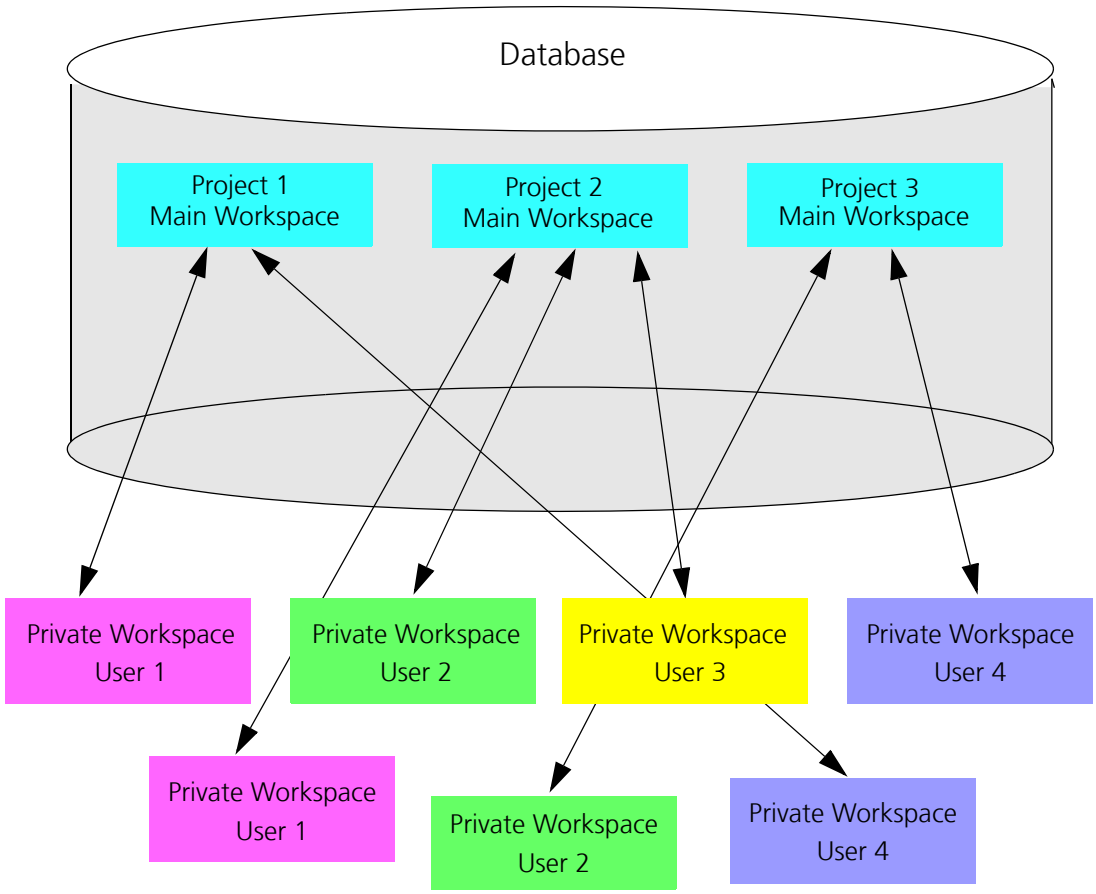
- A working area can be defined to load only a part of a project from the TEMS CellPlanner Server.
- Data is loaded from the TEMS CellPlanner Server only when requested by the TEMS CellPlanner Client.
- Only modified data is written to the TEMS CellPlanner Server.

Workspaces

The TEMS CellPlanner Server allows you to modify a version of a project without modifying the original project until you are ready. Project parameters are checked for validity and consistency before you update the project with the new parameters.

TEMS CellPlanner uses the concept of *workspaces* of the following types:

- Private workspace
- Main workspace



In this illustration, there are three projects in the main workspace and four users:

- User 1 has private workspaces (with modify permissions) for Project 1 and Project 2.
- User 2 has private workspaces (with modify permissions) for Project 2 and Project 3.
- User 3 has one private workspace (with modify permissions) for Project 2.
- User 4 has private workspaces (with modify permissions) for Project 1 and Project 3.

Private Workspace

A private workspace is a private copy of a project, in which you can make modifications without changing the main workspace, and without having the private workspace changed by other users. A project in a private workspace is a snapshot of a project at a specific time. You make changes to projects in your private workspace and those changes remain private until you publish your private workspace.

Main Workspace

The main workspace is a project in the database. Several users can have modification privileges for the same project. However, users do not directly modify the main workspace. Users can *publish* modifications made in their private workspaces to the main workspace, and refresh their private workspaces with modifications done by others and published to the main workspace.

Publishing Changes

Publishing changes means moving changes from your private workspace to the main workspace. To publish changes to a main workspace, you must have modify privileges. When you publish changes and refresh your private workspace, conflicts are detected by the software and can be resolved.

Refreshing Workspaces

Refreshing workspaces means updating your private workspace with the most current main workspace. When you refresh a private workspace, modifications published to the main workspace by yourself and others *overwrite* your existing private workspace. When you refresh your private workspaces, conflicts are detected and can be resolved.

How to Work with Projects on Server

Follow the process below when working with projects on server:

1. Ensure the TEMS CellPlanner Server is started by an administrator, see *TEMS CellPlanner Installation Guide*.
2. Start the TEMS CellPlanner Client.
3. Create a project (completely new project or existing project from file) and store on the server. Another option is to load an existing project from the server. A private workspace (copy of main workspace) will be created if opened for the first time.
4. Work on the project and make changes. The changes will only be in your private workspace until they are published.
5. Compare your private workspace with the main workspace.
6. Store your private workspace to the server to save the changes you make to the project.
7. Publish your private workspace to the main workspace. This step will transfer your changes to the main workspace and other users in the system can perform a refresh to update their private workspaces with the newly published changes.
8. If one or more conflicts occur during publish as a result from other published changes then resolve them and continue with the publish. For each conflict you can either choose to keep your change or accept the change made by another user.
9. Close the project.
10. If other users are working on the same project and have published their changes, refresh your private workspace to update with the latest changes.

Logging In and Out on Server

Convention: Whenever occurring in this manual, "TEMS CellPlanner Server" stands for "Enterprise Server" or "Zero Admin Server"

Login to the Server

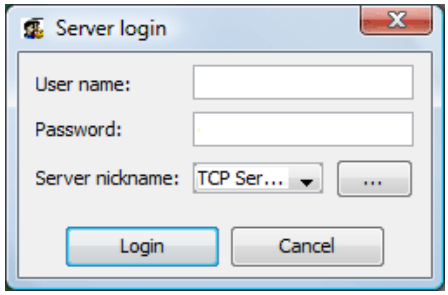
Use this procedure to login to the TEMS CellPlanner Server. For any problem with the login, contact your TEMS CellPlanner administrator.

Prerequisites

- You are a registered user of the TEMS CellPlanner Server.
- The TEMS CellPlanner Client and Server are of the same version.

Procedure

1. Select **File↗Login** in the TEMS CellPlanner window. The **Server login** window is displayed.



Note: If you get a "No valid server licenses" message, licenses might be missing in the TEMS CellPlanner Server, even if you have a valid license for your TEMS CellPlanner Client.

2. Enter your - case sensitive - **user name** and **password** for the TEMS CellPlanner Server.
3. If your network has more than one TEMS CellPlanner Server, you must address the appropriate one from the list of **Server nickname**. There can be more than one server, but only one at a time may be addressed.
4. Click **Login**. Your login name is displayed at the top left window frame.

Logout from the Server

To logout from the TEMS CellPlanner Server, select **File↗Logout.** Any open project is closed and the TEMS CellPlanner window title displays **No project loaded**.

Working with Projects in Private Workspace

Storing new or already defined projects on the server allows multiple users to work in a team with the project.

This section describes how to work with projects stored on a server.

Create Project on the Server

Use this procedure to create projects on the server. You may create a new project on the server, or load an existing project from file into the TEMS CellPlanner Client and then create it on the server.

With a working area defined for the project, only sites included in the area are displayed after project creation on the server. The non-displayed sites are not lost, they just do not appear on the map display if not included in the area.

Prerequisites

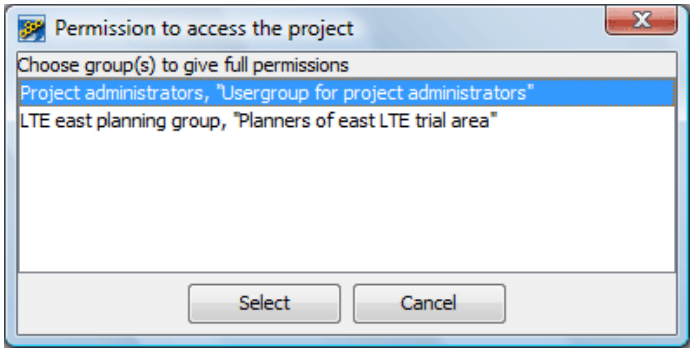
Before creating the project on the server, it is recommended to define working areas for the project. You may define working areas afterwards, but it is advised to do it beforehand for performance reasons. See Apply a Working Area on page 3-20.

Procedure

Follow these steps to create a project on the server:

1. Load a project into the TEMS CellPlanner Client in either of these ways:
   - Create a new project, see Setting Up Projects on page 3-1.
   - Open a project from an existing project file, see Open Existing Project on page 3-6.
   - Import a project file from XML, see Import Project XML Files to TEMS CellPlanner Client on page 18-4.
2. Ensure that the project has a unique project name, that is, a name not already assigned to any project on the server. If needed, change the name from **File↗Project settings**.
3. From **File↗Project settings**, ensure that a map root directory, a coordinate system and an *elevation* and a *landuse* map layers are selected.
4. Login to the Server.
5. Select **File↗Create project on server**. A confirmation message is displayed indicating that the project is being stored on the server. Your private workspace of the project is automatically created in the TEMS CellPlanner Server.

6. If you are member of more than one user group, the **Permission to access the project** window is displayed, as shown in the following example:


Permission to access the project
Choose group(s) to give full permissions
Project administrators, "Usergroup for project administrators"
LTE east planning group, "Planners of east LTE trial area"
Select
Cancel

7. Choose one or more groups to get full permissions to the project and click **Select**. Access to the project is granted to the selected groups.

   Note: *At least one group must be selected, otherwise no one can access the project, including you.*

8. Further administration of project access and permissions is performed in the TEMS CellPlanner User Administration tool, see Administering Users and Projects on Server on page 16-1.

Load Workspace from the Server

Use this procedure to open projects stored on the server. When loading a workspace, you copy the main workspace to your private workspace and load it into the TEMS CellPlanner Client.

Permissions for Opening a Project

To open a project, you must be a member of a user group that has, at a minimum, read access to the project. You can modify projects in your private workspace, but you will get conflicts when publishing changes without modify privileges.

Permissions set for a user group and project apply to your private workspace. If you belong to more than one user group, permissions for your private workspace are those with level of higher access. Example: You belong to user group A including sites 1 - 10, group B including sites 1 - 5 and group C including sites 6 - 10. If you are removed from group B, you can still access sites 1 - 5, as they are also part of group A.

Prerequisites

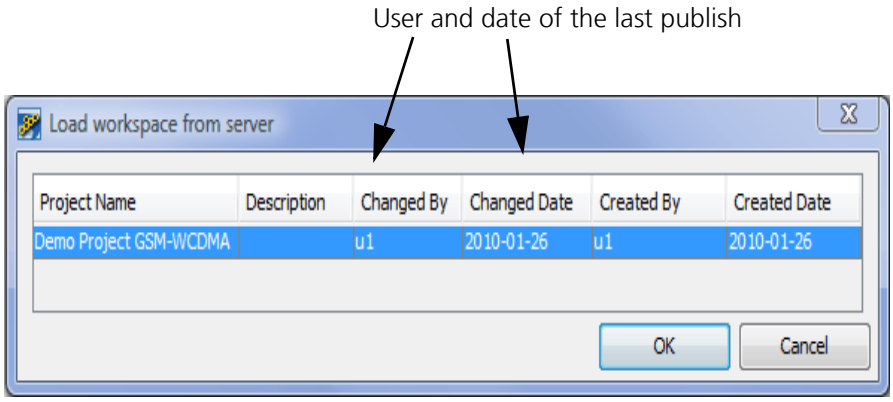
- The project to open is stored on the server, see Create Project on the Server.
- You are logged on to the TEMS CellPlanner Server.

- You have Permissions for Opening a Project.
- Apply a Working Area to limit the number of sites to load.

Procedure

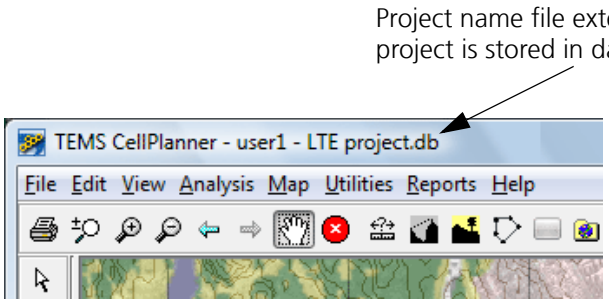
Follow these steps to load projects from the server:

1. Select **File↗Load workspace from server**. The projects for which you have access are displayed in the **Load workspace from server** window as in the following example:



2. Select the project to work with from the list. Your project is displayed in the main map display window. If the amount of data to load is large, a progress indicator appears.

   When you load a project (private workspace) from the server, the title bar of the map display window lists the project name with the file extension .db to indicate that the project was loaded from the server and actually stored in a database, as shown in the example below:


Project name file extension indicates project is stored in database.
TEMS CellPlanner - user1 - LTE project.db
File Edit View Analysis Map Utilities Reports Help

Store Workspace on the Server

Use this procedure to update your private workspace of a project with the changes made in the loaded project.

Prerequisites

- You are logged on to the TEMS CellPlanner Server.
- A project is loaded from the server to the TEMS CellPlanner Client.

Procedure

Select **File↗Store workspace in server**. A priority 1 consistency check is performed to ensure that the project contains no serious inconsistencies. See Restore Project File from Backup on page 3-20 for additional information.

After the consistency check completes, a confirmation message is displayed indicating that the project is being stored on the server.

Compare Workspaces

Use this procedure to view the differences between a project loaded from your private workspace and the main workspace of the project.

Note that the comparison does not really display the difference between the private workspace and the main workspace, despite the name of the procedure. You can make changes in your loaded project and compare them to the main workspace without storing the changes in your private workspace on the server.

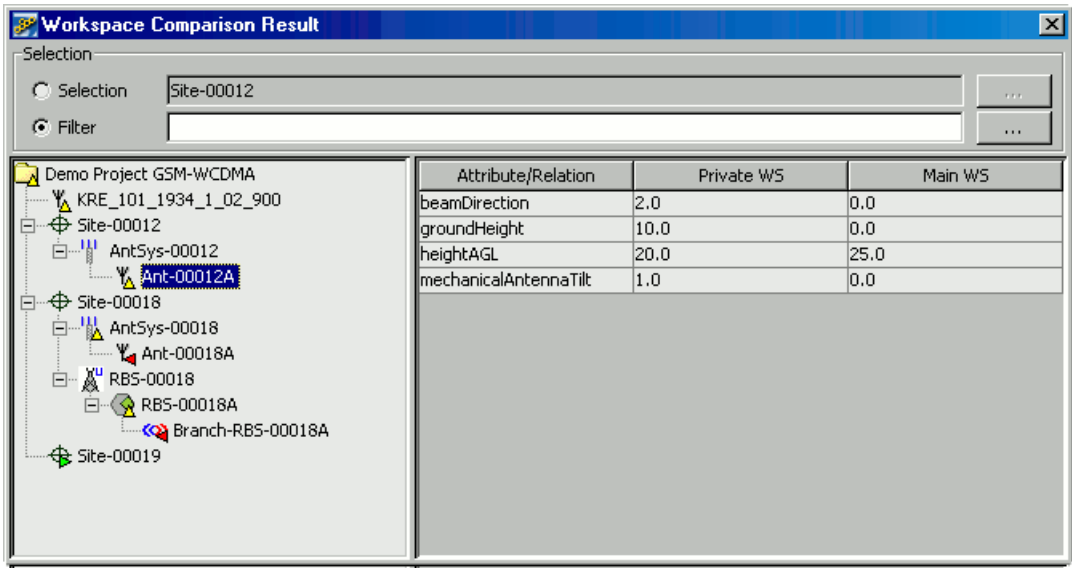
Prerequisites

- You are logged on to the TEMS CellPlanner Server.
- A project is loaded from the server to the TEMS CellPlanner Client.

Procedure

Follow these steps to compare a loaded project with main workspace:

1. Select **File↗Compare workspaces**. The **Workspace Comparison Result** window appears, displaying all differences.



2. Optionally apply a filter or selection to reduce the number of sites to display.

Fields on Window "Workspace comparison results"

Selection	Filter selection panel to filter the displayed sites
Left side: Tree view of differences between main workspace and project loaded from private workspace, with symbols explained below	
Yellow triangle	Object exists in loaded project and main workspace, but at least one attribute or relation is different
Green arrow	Object exists in loaded project but not in main workspace. It has either been added to the loaded project or deleted from the main workspace.
Red arrow	Object does not exist in loaded project but in main workspace. It has either been deleted from the loaded project or added to the main workspace.
Right side: Differences between individual objects selected on the left side	
Attribute/Relation	Name of the differing system object (non-site object) or relation
Private WS	Value of the object in the loaded project
Main WS	Value of the object in the main workspace

Publish Entire Workspace

When you are ready to merge your changes in your private workspace into the main workspace, you publish your changes. You can either publish changes made on all sites, or select the sites for which you want to publish the changes.

Use this procedure to publish changes made to all sites in your private workspace.

See also Publish Part of Workspace on page 15-13.

Permissions for Publishing Modifications

To publish changes to the main workspace, you must have Permissions to modify projects.

New sites may be published only when you have permission to create sites in the project. *New system objects* may be published only when you have permission to create objects in the project.

If you have permission to publish changes to a project, but no permission to create system objects, you are notified about conflicts on all changed objects you are not allowed to update in the main workspace. To resolve the conflict, cancel the publishing, and contact the TEMS CellPlanner administrator to obtain rights to modify the objects in a new publishing attempt.

When you publish new sites or objects, all user groups to which you belong and with modify permissions for the project, get immediate permission to modify sites and objects.

Resolving Conflicts

This section is valid for work towards an Enterprise Server. If you save your projects on a Zero Admin Server, there is no need for conflict resolution, since "last publish wins". This means if two users are working on the same object, the latest publish is kept in main workspace.

When you publish modifications, they are merged in the main workspace. When some objects have been modified concurrently by other users, a window is displayed to Resolve Workspace Conflicts. For each object in conflict, you can cancel publishing, or overwrite the project with your changes.

When you have resolved all conflicts, you can publish the workspace again. New conflicts might arise as a result of previous choices and a new conflict window is then displayed. This is repeated until no new conflicts occur. Normally one iteration of conflict resolution is enough.

When you have resolved all conflicts and inconsistencies, the changed values are stored in the main workspace.

Tip: To minimize the risk of complex conflict scenarios, use the permission settings of TEMS CellPlanner. With permission you can assign modification rights to sites and other properties in the TEMS CellPlanner project.

Permission rights are linked to user groups, and user groups include users. Users are members of one of more groups and by creating several groups with different modification rights you reduce the number of users that can change a certain property. If the users can have separate areas of responsibility in the project, the risk of concurrent changes is minimized.

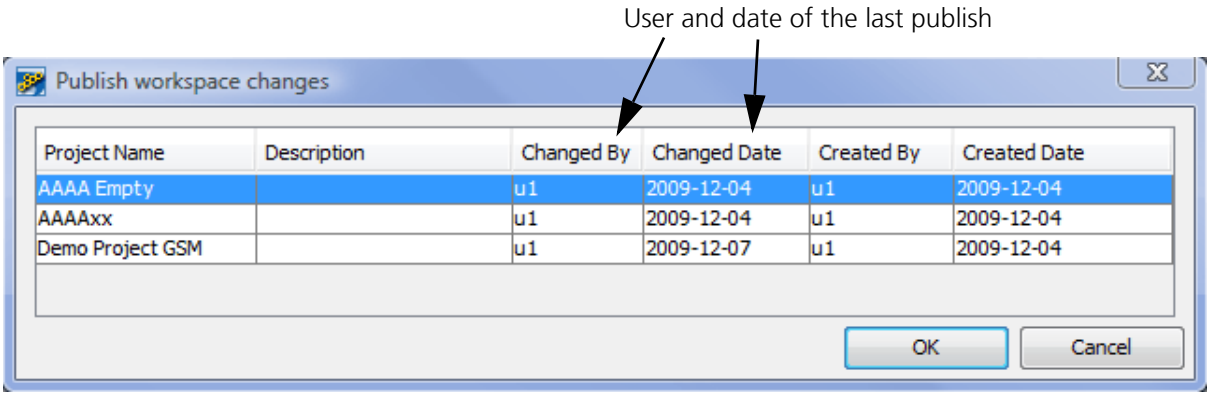
Prerequisites

- You are logged on to the TEMS CellPlanner Server.
- A project is loaded from the server to the TEMS CellPlanner Client.
- You have Permissions for Publishing Modifications.

Procedure

Follow these steps to publish changes made in your private workspace to the main workspace:

1. To publish the entire workspace, select **File↗Publish workspace↗Publish entire workspace...**. The **Publish workspace changes** window appears:



2. Select the workspace to publish from the list in the **Project Name** field, showing the private workspaces on the TEMS CellPlanner Server,
3. Optionally choose if you want to store any unsaved changes since the last time you stored, or discard any unsaved changes before you publish.
4. A confirmation message indicates that the workspace is published.

Publish Part of Workspace

When you are ready to merge your changes in your private workspace into the main workspace, you publish your changes. Use this procedure to publish changes of selected sites in your private workspace.

The rules for partial publishing depend on where you save your project:

- If you work towards an Enterprise Server: You can either publish changes made on all sites, or select the sites for which you want to publish the changes.
- If you work towards a Zero Admin Server: You can either publish changes on all sites, or deselect the objects for which you do not want to publish changes.

See also Publish Entire Workspace on page 15-12.

Prerequisites

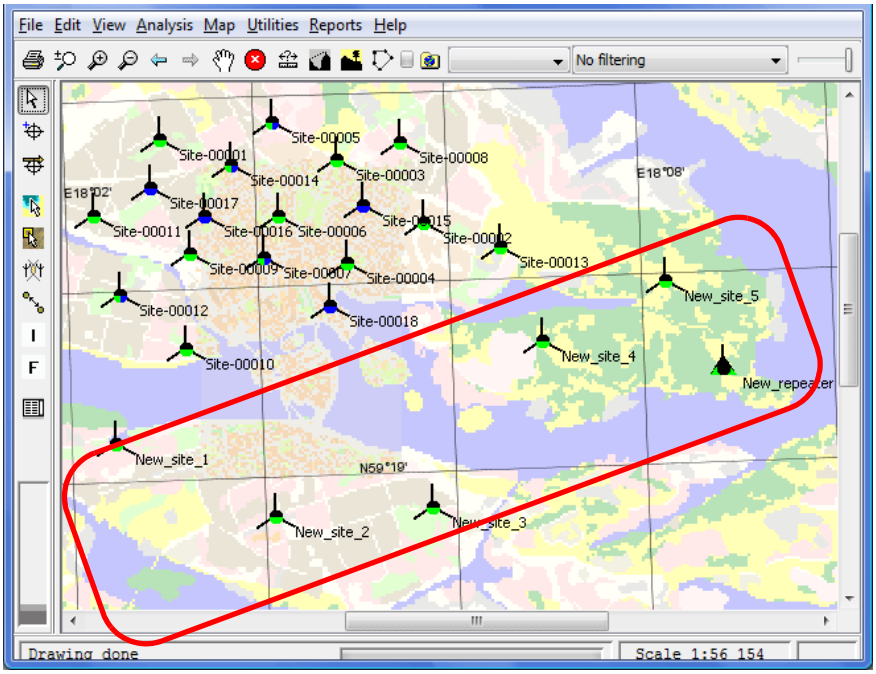
See prerequisites of Publish Entire Workspace on page 15-12.

Procedure

Follow these steps to publish selected parts made in your private workspace to the main workspace:

1. In this example user A and user B simultaneously work on a GSM project loaded into their private workspaces.

   User A has added 5 GSM RBS sites and one GSM radio repeater site to the project as illustrated in the figure below:



2. If you work towards a Zero Admin Server, you should Compare Workspaces to get a full picture of all changes before proceeding with the publish.

   Reason: When working towards a Zero Admin Server, the workspace comparison result window shows all differences between private workspace and main workspace, while the partial publish window only shows the changes possible to publish.

Example: If the main workspace has a newly created object that does not exist in your private workspace, you will see that object in the workspace comparison window, but not in the partial publish window, as it is not of interest for your publishing.

3. User A initiates publishing of new sites by selecting **File↗Publish workspace↗Publish part of workspace...**. The **Partial publish** window shows the difference between private and main workspace, see figures below. Note that the layout of the window depends on the server type.
4. Optionally use a **Selection** or **Filter** to limit the number of sites in the list.
5. Select what to publish or not publish depending on where the project is stored:

   Enterprise Server: **Select** the sites to publish.
   A selected site is marked with a green check mark.

   Zero Admin Server: **Unselect** the objects that shall not be published.
   A deselected object is grayed out.

Figure 15–1 Partial publish window for publish towards an Enterprise Server

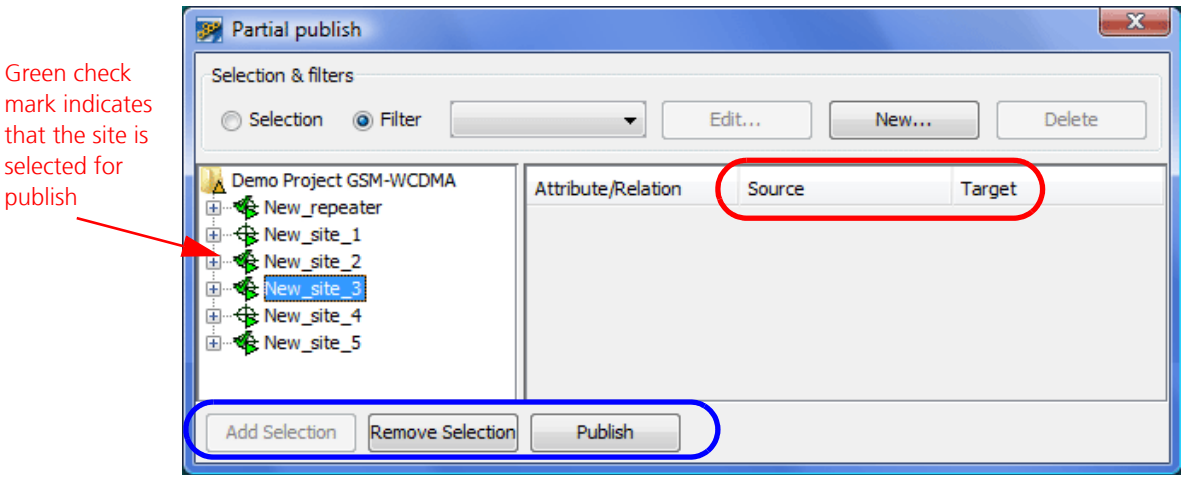
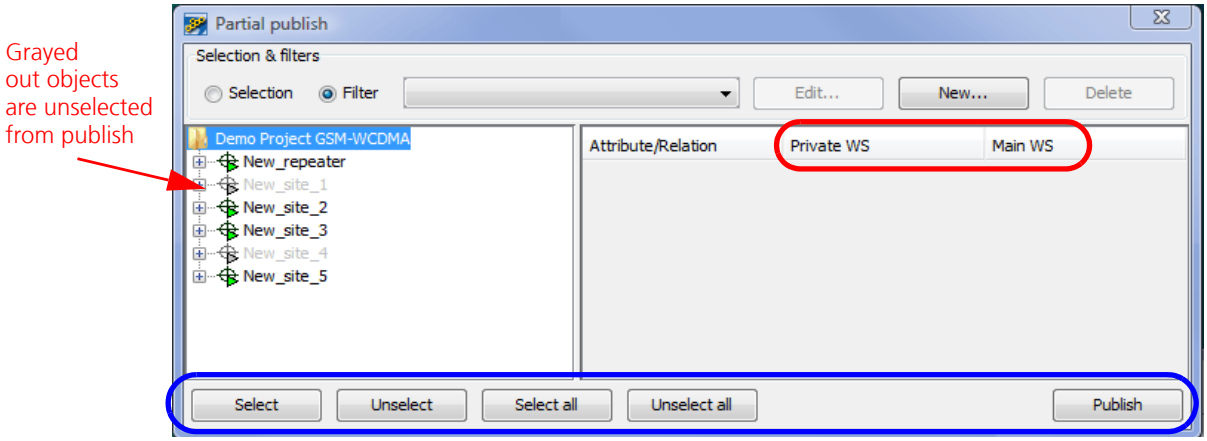


Figure 15–2 Partial publish window for publish towards a Zero Admin Server



Most sites can be individually selected or unselected, with some Exceptions from Individual Selection.

In the example above the user has selected sites 2 and 3. The radio repeater and its donor cell in site 5 are automatically pre-selected.

For complete information on symbols, fields and buttons, see Fields on Windows "Partial publish" and "Partial refresh" on page 15-17.

6. Click **Publish** to merge selected parts of the private workspace into the main workspace. If you work towards an Enterprise Server, you might need to Resolve Workspace Conflicts.
7. A confirmation message indicates that the workspace is published.

See Refresh Part of Workspace on page 15-20 to view what happens when user B selects to refresh his/her workspace with the changes published by user A.

Fields on Windows “Partial publish” and “Partial refresh”

The layout is slightly different depending on server type:

Selection	Filter selection panel to filter the displayed sites
Left side: Tree view of differences between main workspace and project loaded from private workspace, with symbols explained below	
Yellow triangle	Object exists in loaded project and main workspace, but at least one attribute or relation is different
Green arrow	Object exists in loaded project but not in main workspace. It has either been added to the loaded project or deleted from the main workspace.
Red arrow	Object does not exist in loaded project but in main workspace. It has either been deleted from the loaded project or added to the main workspace.
Right side: Differences between individual objects selected on the left side	
Attribute/Relation	Name of the differing system (non-site) object or relation
Source	Value of the object in the source workspace
Target	Value of the object in the target workspace
Bottom:	
Publish	Appears in the **Partial publish** window. Merges changes from source (private) workspace with the target (main) workspace.
Refresh	Appears in the **Refresh publish** window. Merges changes in source (main) workspace with the target (private) workspace.
...if working towards an Enterprise Server:	
Add selection	Selects the highlighted object for publish (or refresh). Selected object is marked with a green check mark.
Remove selection	Unselects an object from being published (or refreshed).
...if working towards a Zero Admin Server:	
Select	Selects the highlighted object for publish (or refresh).
Unselect	Unselects an object from being published (or refreshed).
Select all	Selects all objects for publish (or refresh).
Unselect all	Unselects all objects for publish (or refresh)

Resolve Workspace Conflicts

This section is valid for work towards an Enterprise Server. If you save your projects on a Zero Admin Server, there is no need for conflict resolution, since "last publish wins". This means if two users are working on the same object, the latest publish is kept in main workspace.

Use this procedure to resolve workspace conflicts when you are unable to publish a workspace because your changes conflict with the changes published by one or more other users working with the same project.

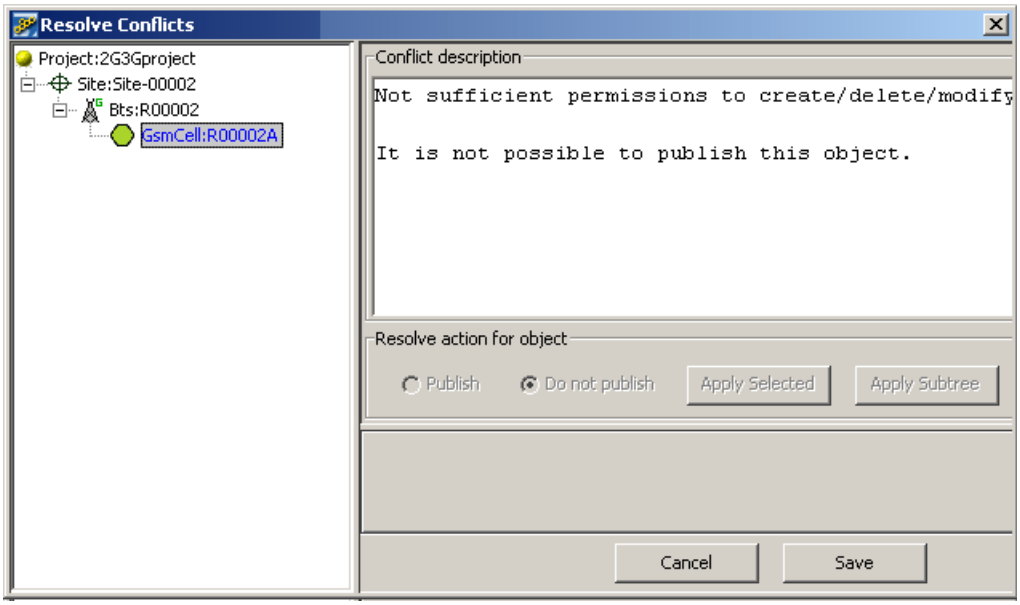
Prerequisites

- You are logged on to the TEMS CellPlanner Server.
- A project is loaded from the server to the TEMS CellPlanner Client.
- You have Permissions for Publishing Modifications.

Procedure

Do as follows to resolve conflicts found when attempting to publish a workspace:

1. The following window is displayed when you attempt to publish changes and conflicts are discovered. Expand the project tree on the left of the window to display the conflict descriptions.



2. Select a resolution for the conflict found for the object. If the other users agree that your changes should override their changes, click **Publish**. If you want the changes made by other users to override your changes, click **Do not publish**.

3. When you have resolved all conflicts, click **Save**. The window closes and, depending on the selected resolution, the conflicts are published or not published.

Fields on Window "Resolve Conflicts"

Left side	Tree view of sites and objects with conflicts. Details are described in **Conflict description.**
Conflict description	Description of the conflict found for a site or object.
Publish	Resolves the conflict by publishing the modifications of the object in made to a private workspace object to the main workspace.
Do not publish	Resolves the conflict by not publishing the modifications to the main workspace.
Apply Selected	Applies the specified resolution to the object selected in the tree.
Apply Subtree	Applies the specified resolution to the object selected in the tree, and all related objects below it.

Refresh Entire Workspace

You can refresh your private workspace with changes published to a project by you or other users. When refreshing your private workspace the changes done in the main workspace are merged into the private workspace. When conflicts occur you can keep the private workspace changes or overwrite them with values from the main workspace. The resulting project is checked for inconsistencies in the same way as when publishing changes.

Use this procedure to refresh your private workspace with all changes in the main workspace.

See also Refresh Part of Workspace on page 15-20.

Prerequisites

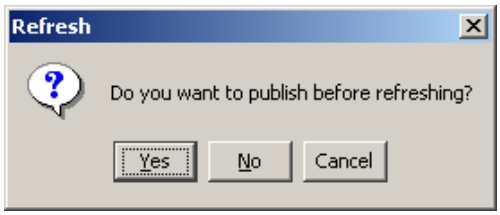
- A project stored on server is opened as a private workspace in the TEMS CellPlanner client.
- You are logged on to the TEMS CellPlanner Server.
- There must be no open workspace when you do a refresh. The Refresh option is disabled when a workspace is loaded.

Procedure

Follow these steps to refresh your private workspace with changes to a project:

1. Select **File↗Refresh workspace↗Refresh entire workspace...**.

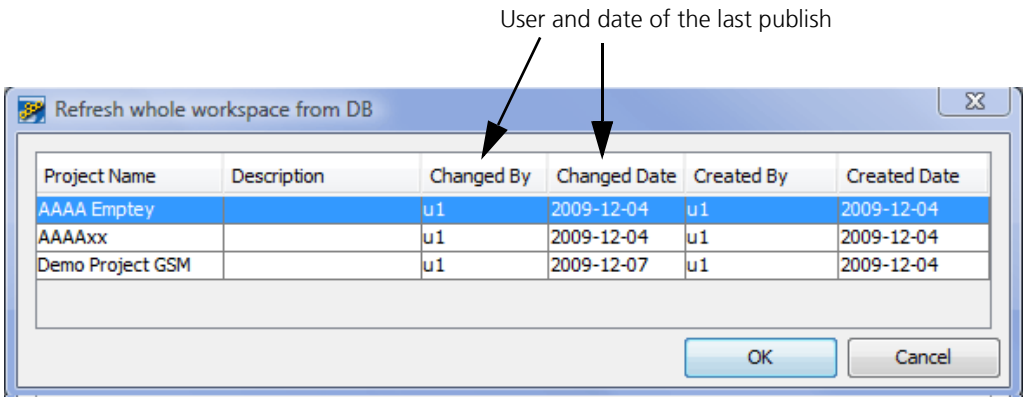
2. If you work towards an Enterprise Server and have not already published your workspace changes, a message is displayed giving you the option to publish before refreshing the workspace, so you do not lose the changes you made to the project. The message looks as follows:



Note: When you refresh your workspace from Enterprise Server, you overwrite the existing private workspace with a new version of the main workspace. If you have made any changes to the project in your private workspace and do not publish the workspace first, you will lose your changes when refreshing your private workspace.

Select **Yes** to publish before refresh, or **No** to refresh immediately.

3. The **Refresh whole workspace from DB** appears. Your private workspaces on the server are listed in the **Project Name** fields:



4. Select the private workspace to refresh and click **OK**.

Refresh Part of Workspace

Use this procedure to refresh your private workspace with changes made to selected sites in the main workspace.

See also Refresh Entire Workspace on page 15-19.

Exceptions from Individual Selection

If you work towards an Enterprise Server, you can normally select sites individually for publish or refresh. Some sites are though automatically pre-selected and cannot be unselected:

- New radio repeaters with donor cells
- All neighboring sites of new sites
- All sites affected by a changed system object.
  Only sites, never system objects, may be selected individually.

If you work towards a Zero Admin Server, you can normally select objects individually for publish or refresh. Some objects are though automatically selected or unselected in pairs to avoid inconsistency in the database. Some examples are objects affected indirectly by creation or removal of other objects, such as:

- Radio repeater with donor cell
- Neighbor relations
- System objects used by aggregated objects

Prerequisites

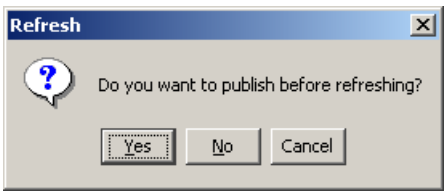
See prerequisites of Refresh Entire Workspace on page 15-19.

Procedure

In the example from Publish Part of Workspace on page 15-13, user B and user A simultaneously work on a GSM project loaded into their private workspaces. User A has published 3 additional GSM RBS sites and 1 GSM radio repeater site. Now user B wants to take in recent changes of the project on server.

Do as follows to refresh your private workspace with selected changes in a project:

1. Select File↗Refresh workspace↗Refresh part of workspace...
2. If you work towards an Enterprise Server and have not already published your workspace changes, a message is displayed giving you the option to publish before refreshing the workspace, so you do not lose the changes you made to the project. The message looks as follows:



Note: *When you refresh your workspace from Enterprise Server, you overwrite the existing private workspace with a new version of the main workspace. If you have made any changes to the project in your*

private workspace and do not publish the workspace first, you will lose your changes when refreshing your private workspace.

Select **Yes** to publish before refresh, or **No** to refresh immediately.

3. The **Partial refresh** window appears, showing the differences between your private workspace and the main workspace, as in the examples below.

Figure 15–3 Example of partial refresh towards Enterprise Server

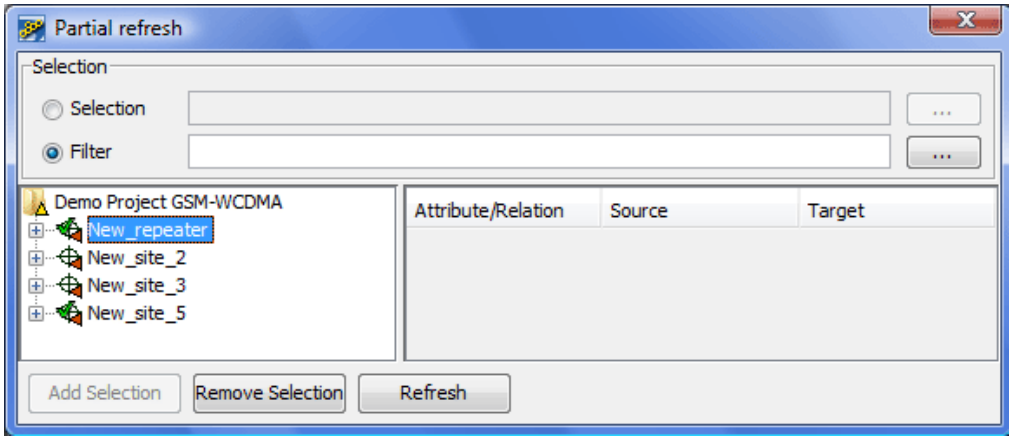
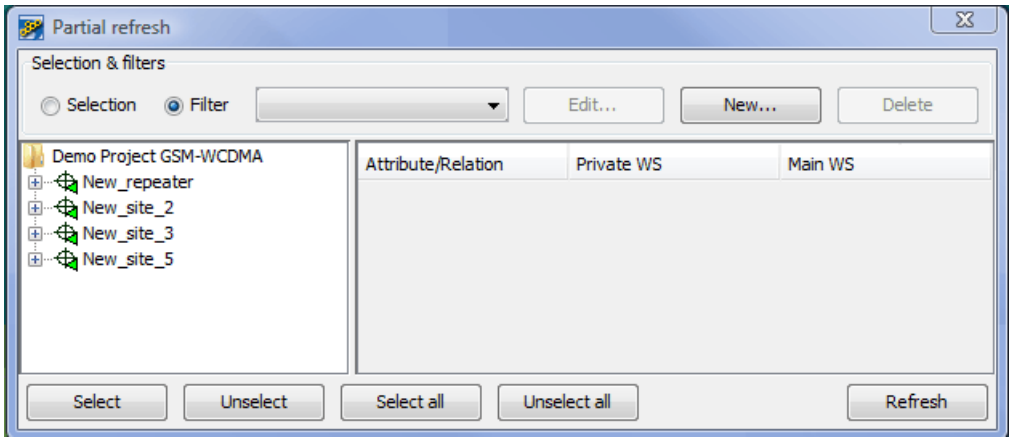


Figure 15–4 Example of partial refresh towards Zero Admin Server



The window shows the difference between the private workspace and the main workspace. For information on symbols, fields and buttons, see Fields on Windows "Partial publish" and "Partial refresh".

Note: *If you are working towards a Zero Admin Server, you should Compare Workspaces to get a full picture of all changes before proceeding with the refresh. The workspace comparison result window shows all differences between private workspace and main workspace, while the partial refresh window only shows the changes possible to refresh.*

Example: If your private workspace has a newly created object that does not exist in main workspace, you will not see that object in the partial refresh window, as it is not subject to refresh.

4. Optionally use a **Selection** or **Filter** to limit the number of sites in the list.
5. Select individual sites to fetch from the main workspace. A green check mark indicates that the site is selected. In this example there are 3 new RBS sites and 1 new radio repeater site. Most sites can be individually selected or unselected, with some Exceptions from Individual Selection.
6. Click **Refresh**. The private workspace is updated with the selected sites. There are never any conflicts at refresh, as all data in private workspace are overwritten by data from main workspace.

Delete Workspace

When working with a project on server, you might have done too many changes, or in some other way lost track to such extension that you need to undo all changes.

There is no undo mechanism for individual changes, but you can get rid of all unpublished changes by deleting your private workspace from the server.

Prerequisites

- You are logged on to the server.
- You have a private workspace open in your TEMS CellPlanner client.

Procedure

Do as follows to delete your private workspace:

1. Select **File↗Delete workspace...** from the menu. A window appears with a list of your current private workspaces.
2. Select the workspace to delete from the list and click **OK**. The workspace is deleted from the server.

After deletion you can load the project to a new private workspace and start all over with updating the project.

Working Offline with Projects on Server

You can *work offline* with a project from the TEMS CellPlanner Server by making a temporary copy of the workspace and save it to a local file on your computer. This allows you to still access the project even though you leave the network of the TEMS CellPlanner Server, for example for a demo without network access, or to work on the project at some remote location. You can also move the offline project to another computer. When you are reconnected to the network, you publish your changes and resume the work in a team.

You do not need to remain logged in on the server when you work offline. However, you must store the offline project to your private workspace on the server before making online changes.

Limiting Number of Sites in an Offline File

To save space on your local computer you can Apply a Working Area to just load parts of the workspace from the server before taking the project offline. Only the parts loaded to your private workspace will be saved to your offline file.

When you work offline you may define another working area than the one used when saving the offline file. Only the sites included in your working area, and sites with relations to cells in the working area, will be normally displayed. Other sites are grayed out as overview sites.

Keep in mind that all sites still exist in the main workspace on the server, even though you might not see them in the offline copy. All sites in your working area appear when you are online and publish the offline project to the server.

Save Workspace to File and Work Offline

Use this procedure to save a workspace stored on a TEMS CellPlanner Server to a local file on your computer, so you can work offline with the project without being connected to the TEMS CellPlanner Server.

Prerequisites

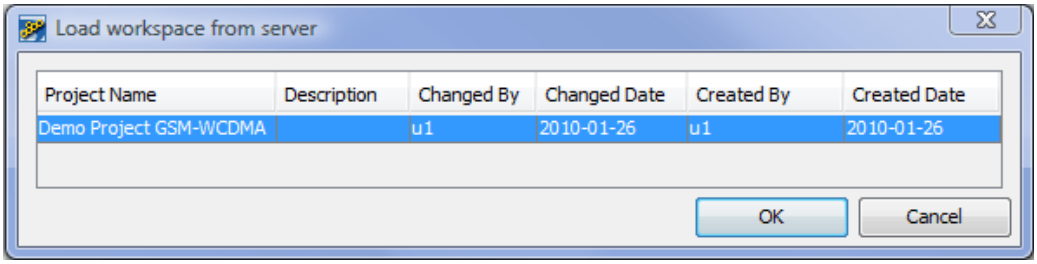
- You are a logged on to the TEMS CellPlanner Server.
- The project to take offline is stored on an TEMS CellPlanner Server.
- You have planned which sites to load for offline work. To go offline with a project you must first know if you shall load the entire project, or just load a part of the project by setting a working area.

  Important: If you take a part of a project offline you cannot access any site outside the loaded area. Apply a Working Area including the whole project if you do not know which sites to work with offline, given that your computer can handle the amount of project data.

Procedure

Do as follows to save a private workspace of a project to an offline project file:

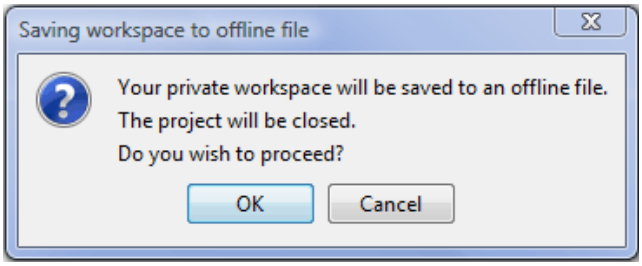
1. Select **File↗Load workspace from server**. The available projects on the server are listed as in the following example:



2. Select a project and click **OK**. The sites are displayed in the map window. Sites within, or with relations to cells in, your working area or filter are displayed as usual, other sites are grayed out as overview sites.

   Note: *Overview sites will not be saved to your offline file.*

3. Select **File↗Save As...**. to open a file browser, and enter the name of the project file to save for offline work.
4. Click **OK**. A message indicates that you are taking your workspace offline from the server, as shown in the following example:


Saving workspace to offline file
Your private workspace will be saved to an offline file.
The project will be closed.
Do you wish to proceed?
OK
Cancel

5. Click **OK**. The project is saved as a file, and the project file and your private workspace are closed.
6. Use **File↗Open** to open the offline file for working offline from the server.

Important: You shall now only work offline with the project, and you must return the offline project to your private workspace before you make any changes in your private workspace. Modifying the project in two places might lead to unresolvable conflicts.

Save Offline File to Server

Use this procedure to save an offline project file to the TEMS CellPlanner Server.

The TEMS CellPlanner Server contains a record of the offline project as an "offline workspace". TEMS CellPlanner alerts you if you try to save an offline workspace that does not match this record, or if you attempt to update a project on the server before returning the offline workspace to your private workspace on server.

Important: You must return the offline project to your private workspace before you make any changes in your private workspace. Modifying the project in two places might lead to unresolvable conflicts.

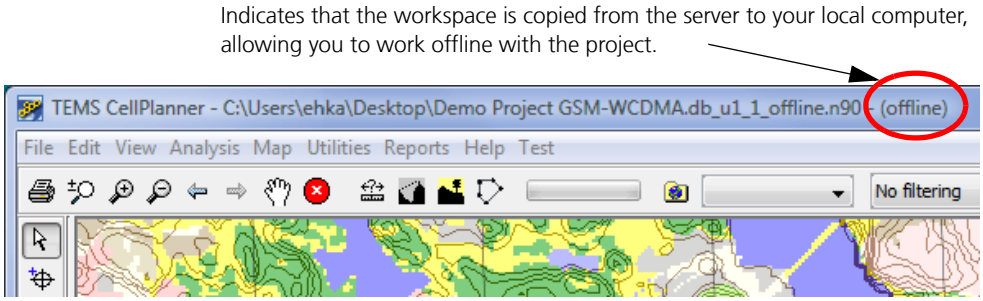
Prerequisites

- The project is stored on the TEMS CellPlanner Server, and as a project file.
- You are a logged on to the TEMS CellPlanner Server.

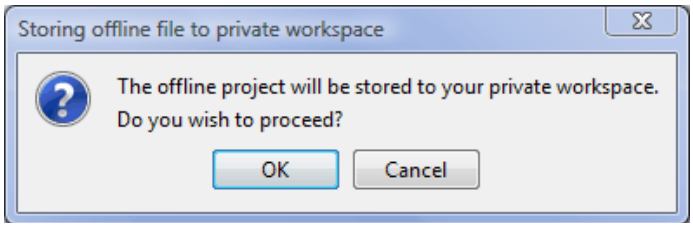
Procedure

Do as follows to save an offline project file as a private workspace on the server:

1. Select **File↗Open**. The **Open** window is displayed so you can select the offline workspace from a list of files.
2. Click **OK**. The workspace is loaded and displayed in the main map display window. The title bar of the main map display window indicates that the workspace is offline, as shown in the following example:


Indicates that the workspace is copied from the server to your local computer, allowing you to work offline with the project.
TEMS CellPlanner - C:\Users\ehka\Desktop\Demo Project GSM-WCDMA.db_u1_1_offline.n90 - (offline)
File Edit View Analysis Map Utilities Reports Help Test
No filtering

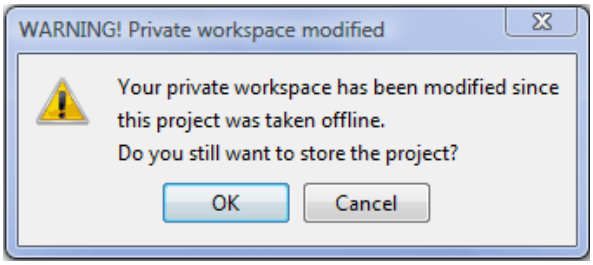
3. Select **File↗Store workspace in server**. The following message appears:


Storing offline file to private workspace
The offline project will be stored to your private workspace.
Do you wish to proceed?
OK
Cancel

4. Click **OK** to update your private workspace on the server with the changes made in the offline project. The project will be closed.

Normally it ends here, but if any of the following messages appear, you must really know what you are doing before proceeding:

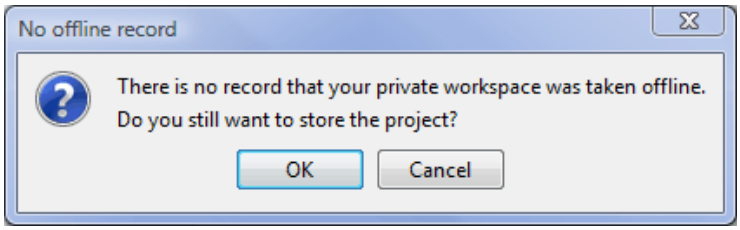
- **Private workspace modified**


WARNING! Private workspace modified
Your private workspace has been modified since this project was taken offline.
Do you still want to store the project?
OK
Cancel

Caution: You proceed at your own risk if you get this message!

For some reason your private workspace of the project on server has been modified although the project has been taken offline. You can proceed if the offline project has not been modified, or if you know that changes made offline do not conflict with your private workspace, Otherwise you should manually update the project in your private workspace with the changes in the offline project.

- **No offline record**


No offline record
There is no record that your private workspace was taken offline.
Do you still want to store the project?
OK
Cancel

You might get this message if the server has no knowledge on that you are working offline with the project, for example due to any of the following:

- You have temporarily saved your project to a project file because you were working on it in your private workspace on server, but the network connection was lost and you were prompted to save the project as a file.
- You have already stored the offline file, but you try to store it again.

16
Administering Users and Projects on Server

This chapter describes how to administer the users of TEMS CellPlanner projects stored in database accessed via a TEMS CellPlanner Server.

The procedures in this chapter are intended for TEMS CellPlanner Server administrators only.

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About Administering TEMS CellPlanner Users and Groups

Projects stored on server can by shared by users belonging to the same user group.

Various permissions can be assigned per user group and project. An administrator may turn off all restrictions - except for restrictions on project deletion - by giving full permissions.

The users and groups in the table below are automatically created and given initial privileges when you install the TEMS CellPlanner Server software:

Group name:	Initial group member:	Initial privileges of the group:
Administrators	user name **ADMIN** password: ADMIN	user administration privileges + project creation privileges
Project administrators	user name **PROJECT_ADMIN** password PROJECT_ADMIN	project creation privileges
Regular users	(initially empty group)	(no initial privileges, empty group)

An administrator may add and delete users and user groups, and grant or deny permissions and privileges of user groups.

Terminology for Administrators

server

Whenever occurring in this chapter, “server” or “TEMS CellPlanner Server” stands for “Enterprise Server“ or “Zero Admin Serverr”

user

A user has a name and a password registered in the server, and can be in state “active” or “registered”.

Two initial users are created when you install the server software:
ADMIN and **PROJECT_ADMIN**.

A user must be member of a user group to get access to projects on server.

Users can be added, deleted, or have their properties modified by administrators only, see Create User on page 16-9.

user group

Complex planning assignments might require that you divide the planners in groups by geographic area, task, expertise, or similar. Such groups are named "user groups" in TEMS CellPlanner. Minor assignments probably do not require that you divide planners into groups. Users must though belong to a user group to make changes in projects, hence you need at least one group, which in the simple case includes all planners.

A user group includes a number of users, also called members. Each group is characterized by its project specific permissions and project independent privileges. You can for example assign permissions to delete sites to a group of experienced or specially trusted users, but just give modify permissions to other user groups.

Three initial user groups are created when you install the server software: Administrators, Project administrators and Regular users.

A user group can be created, and existing groups be modified or deleted, by an administrator only, see Create User Group on page 16-12.

administrator

Members of user groups with user administration privileges are termed "administrators".

Initially only group Administrators with initial user ADMIN has such privileges, but any group can be given them by an administrator.

Important: It is recommended to have at least two administrators in your organization to avoid dependency on a single person.

---

project creator

Members of user groups with project creation privileges are termed "project creators".

Initially only the groups Administrators and Project administrators have such privileges, but any group can be granted them by an administrator.

privileges

Privileges are set per user group, but unlike permissions they are not bound to specific projects. There are two types of privileges:

- user administration privileges
  Admits the following server operations:
  - create, edit and delete users and user groups
  - delete projects
  - grant or deny project independent privileges
  - grant or deny permissions
    (also project creators may grant permissions, but only when creating a project, and only for that project)

- project creation privileges
  Admits creation of projects on server; such privilege is granted with permission Create projects.

permissions

Permissions are granted per project and user group.

The permissions regulate what the group members are allowed to publish from their private workspaces to the main workspace on server. Users working in private workspace of a project will experience that permissions have changed first when publishing the private workspace. Users experience no restrictions when working with a project in the private workspace, but will be denied publishing changes if they are in conflict with the permissions. The project administrator should inform the users about their permissions.

Normally only administrators may assign projects to user groups, and grant or deny permissions. In addition, a project creator may at project creation give full permissions to any group where the project creator is a member. See details in Permissions Overview.

The total permissions of an individual user is an aggregate of the permissions for all user groups to which the user belongs. If a user belongs to more than one group, the permissions applied to a project are those from the group with the most generous permissions to that project. Example: The user belongs to user groups A and B, with permission to create sites in group A but not B, and permission to modify/delete system objects in group B but not A. The user may thus create sites and modify/delete system objects.

Permissions Overview

The following table summarizes the permissions possible to set for projects:

basic permissions	
• modify project content • modify/delete system objects*) • create system objects *) • create sites *) System objects = explorer objects Note that permissions to modify/delete sites are excluded from the basic permissions.	• An administrator may Set Basic Permissions per user group • Without any basic permission, viewing, analyzing and copying the project is still possible • With **Modify project content** selected, parameter values may be modified in the project, and the following permissions become editable: - create sites - create system objects - modify/delete system objects - modify/delete sites
modify/delete sites	
	• May be set per user group and site by an administrator • Selectable only if **Modify project content** is allowed Permissions to Modify and Delete Sites are displayed in the site explorer. See Set Site Permissions by Individual Site Selection on page 16-21 and Set Site Permissions by Filtering Sites on page 16-23.
full permissions	
"full permissions" include all basic permissions Note that permissions to modify/delete sites are not included in basic permissions.	There are two ways of granting full permissions: 1) Per project, at project creation • may be set by the project creator • only for groups where the project creator is a member, namely - to "the" user group if being member of one group only - to selected user group(s) f being member of more groups 2) Globally, anytime • may be set by administrators only • for all user groups and projects at a time • see Give Full Permissions to All on page 16-24

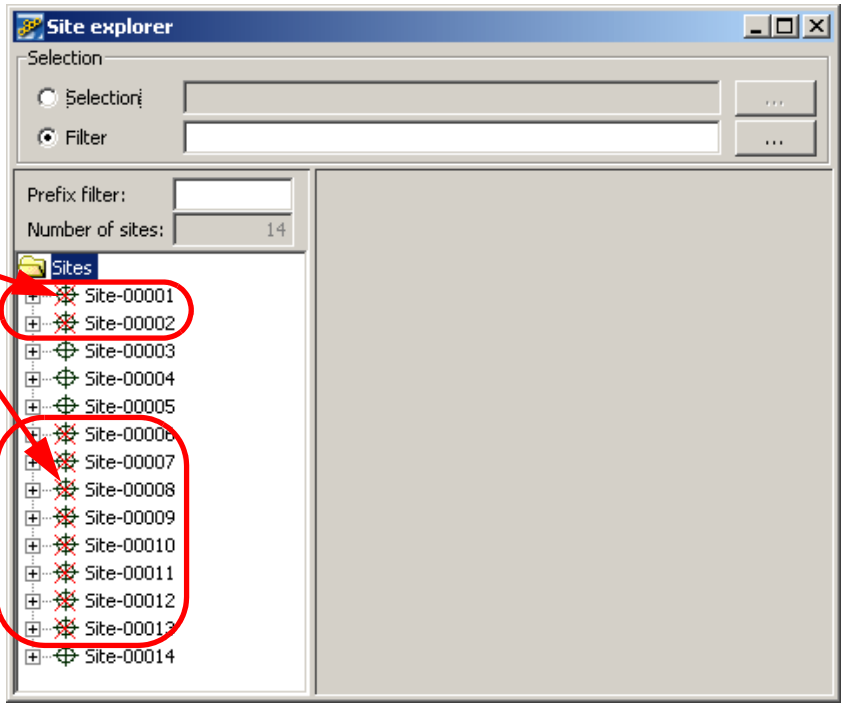
Permissions to Modify and Delete Sites

When a user with permissions to create sites publishes a new site, the user group(s) to which the user belongs is regarded as "owners" of that site, and are thus automatically granted modify/delete permissions for the new site.

To decrease the risk of modifying or deleting other sites by accident, modify/delete permissions on those sites must be explicitly enabled per site.

The currently modify/delete site permissions are viewable in the site explorer of the TEMS CellPlanner client, as in the following example:

Site icons overstruck with a red cross indicate that the user does NOT have modify/delete permissions to these sites



Login to the User Administration Tool

To manage users and user groups working with projects stored on server, you must first login as administrator to the server via the User Administration tool.

Prerequisites

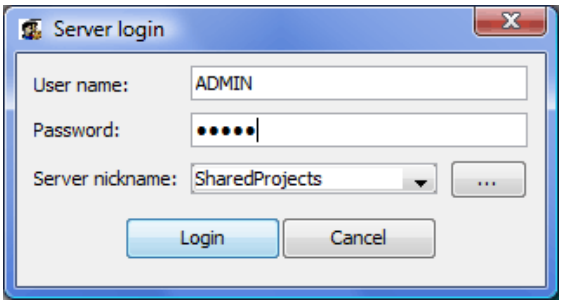
The instructions referred to are found in the *TEMS CellPlanner Installation Guide*.

- You are authorized as administrator of the server.
- The User Administration tool is installed on the computer from where you will administer users and user groups (*see Installing the User Administration Tool*).
- The server properties are configured in the computer from where you will administer users and projects (see *View JBoss JMX Attributes*).
- The server is started (see *Start Enterprise Server* or *Start Zero Admin Server*).

Procedure

Follow these steps to login to the User Administration tool to administer users, user groups and projects on a certain server:

1. Start the User Administration tool from **Programs↗Ascom↗TEMS Products↗TEMS CellPlanner v.x.y↗User Administration** in the start menu. The **Server login** window is displayed.
2. If your network has more than one server, you must address the appropriate server via the **Server nickname**. Only one server at a time can be addressed.
3. Enter the **user name** and **password** of an administrator of the selected server.



4. Click **Login** to open the TEMS CellPlanner Administration Window.
5. Proceed with subsequent instructions to administer users and user groups.

TEMS CellPlanner Administration Window

The following window appears when you Login to the User Administration Tool:

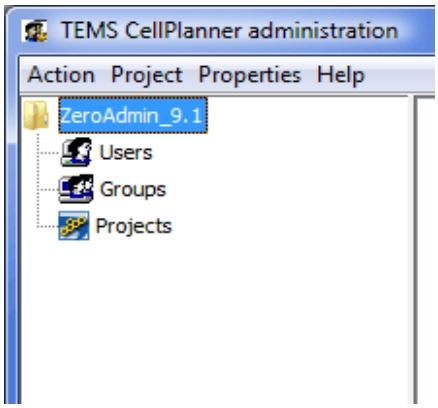


Figure 16–1 Icons in the TEMS CellPlanner Administration Window

Users	See Edit User Properties on page 16-10
Groups	See Edit User Group Properties on page 16-13
Projects	Lists all projects and their (read-only) properties **Name** and **Description** of user group

Figure 16–2 Menu choices in the TEMS CellPlanner Administration Window

Action	• **New** - Adds new users or user groups • **Edit** - Edits existing users or user groups • **Delete** - Deletes users, user groups or projects • **Refresh** - Refreshes the administration view of permissions and stored projects. Needed only if more than one administrator is editing users or user groups at the same time. • **Exit** - Quits the administration tool
Project	• **Export project** - Exports selected projects, optionally also users and user group accounts, to XML file. See Export Projects in Database from TEMS CellPlanner Server on page 19-5. • **Import project** - Imports projects from XML file, optionally together with user and user group accounts, if present. See Import Project XML Files to TEMS CellPlanner Server on page 18-5.
Properties	• **Give all full permissions** - Toggles between granting and denying full permissions to all user groups and projects. Default: Not selected. See Give Full Permissions to All on page 16-24.

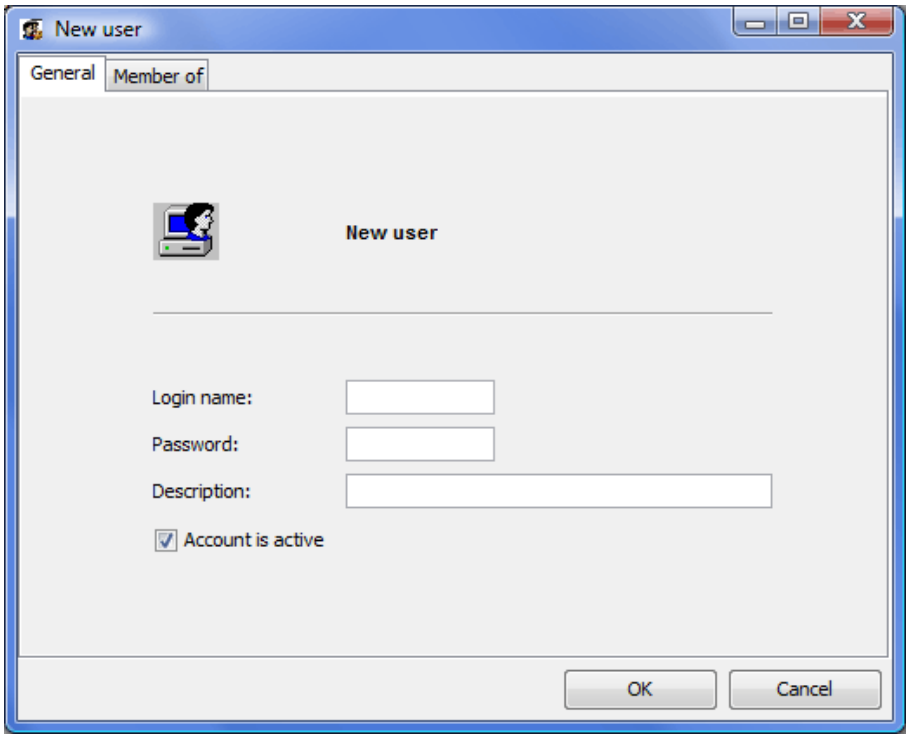
Users and User Groups

This section describes how to create and administer user and user group accounts.

Create User

Do as follows to add new users to the server:

1. Login to the User Administration Tool.
2. Select **Action↗New↗User in** the TEMS CellPlanner Administration Window. The **New user - General** window is displayed as in the following example:



3. Enter **Login name** and **Password** of the new user. Note that the parameters are case sensitive.
4. Optionally enter a **Description** of the new user.
5. Select **Account is active** if the user may immediately login to the server. Clear this option if the user shall just be registered now and be activated later.
6. Click the **Member of** tab to assign the user to one or more existing user groups, as described in Include User in User Groups on page 16-11.
7. Click **OK** to save the user properties.

Edit User Properties

Use this procedure to modify the properties of an existing user.

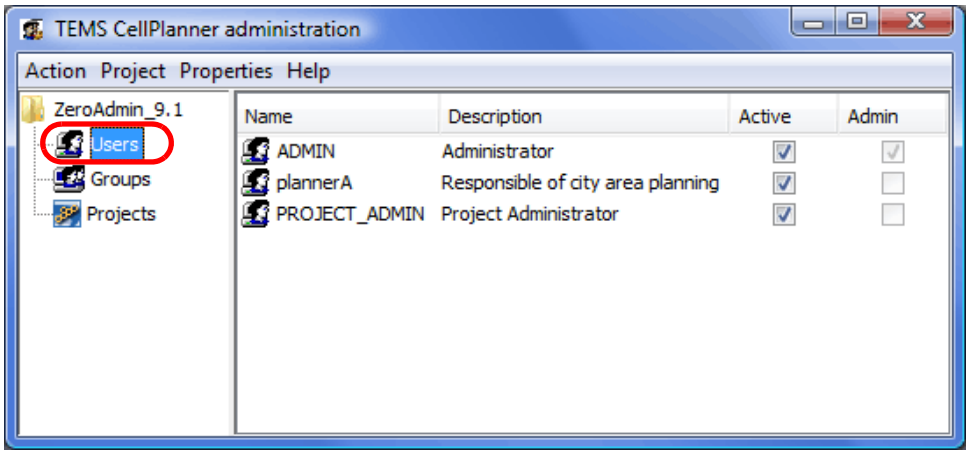
Prerequisites

- The user to edit is defined, see Create User on page 16-9.
- Login to the User Administration Tool.

Procedure

Follow these steps to edit the properties of defined users:

1. Click **Users** in the TEMS CellPlanner Administration Window and select a user from the right side of the window.
   The predefined users ADMIN and PROJECT_ADMIN and the additional user named plannerA are included in the following example:



2. Select the **Active** option for users that may login to the server, or clear the option to block users from logging in. A cleared option indicates that the user is just registered and waiting to become activated.

   All other parameters are read-only. The **Name** is the name of the user. The **Admin** option indicates if the user has user administration privileges.

3. Select a user by highlighting the row of the user. Right-click and select **Edit** or double-click. The **Edit user** window appears.
4. If needed, modify **Password** and **Description**. See Create User on page 16-9.
5. To add the user to user groups, click the **Member of** tab, as described in Include User in User Groups on page 16-11.
6. Click **OK** to save the modified user properties.

Include User in User Groups

Use this procedure to assign a user as member of defined user groups.

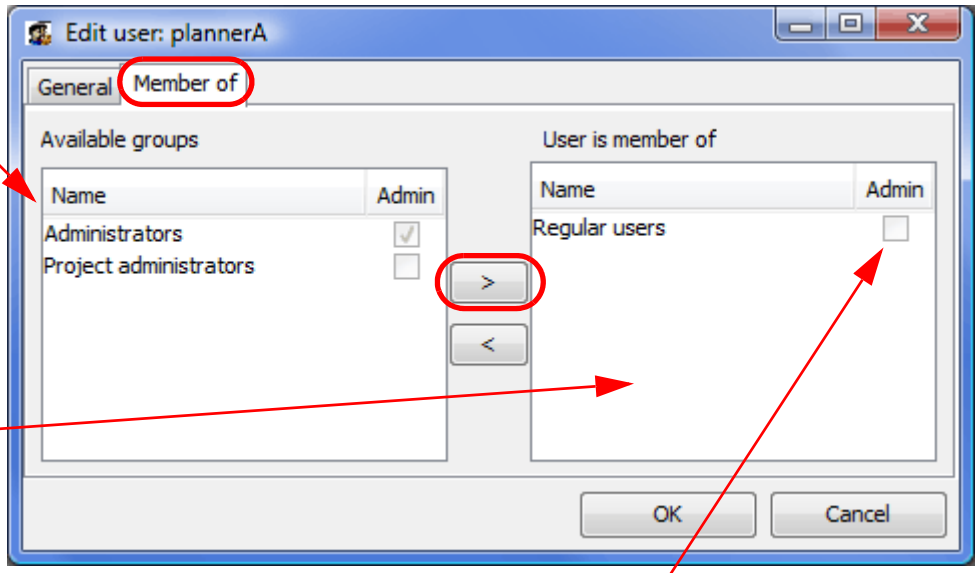
Prerequisites

- User groups are defined, see Create User Group on page 16-12.
- Login to the User Administration Tool.
- A user is selected and the **New user** or **Edit user** window is open, see Create User on page 16-9 or Edit User Properties on page 16-10.

Procedure

Follow these steps to assign a user as member of one or more user groups:

1. Select the **Member of** tab to view available and assigned user groups, as in the following example:



2. Use the [>] button to move **Available groups** to the list **User is member of**, and thereby including the user in groups.

   Use the [<] button for the opposite operation.

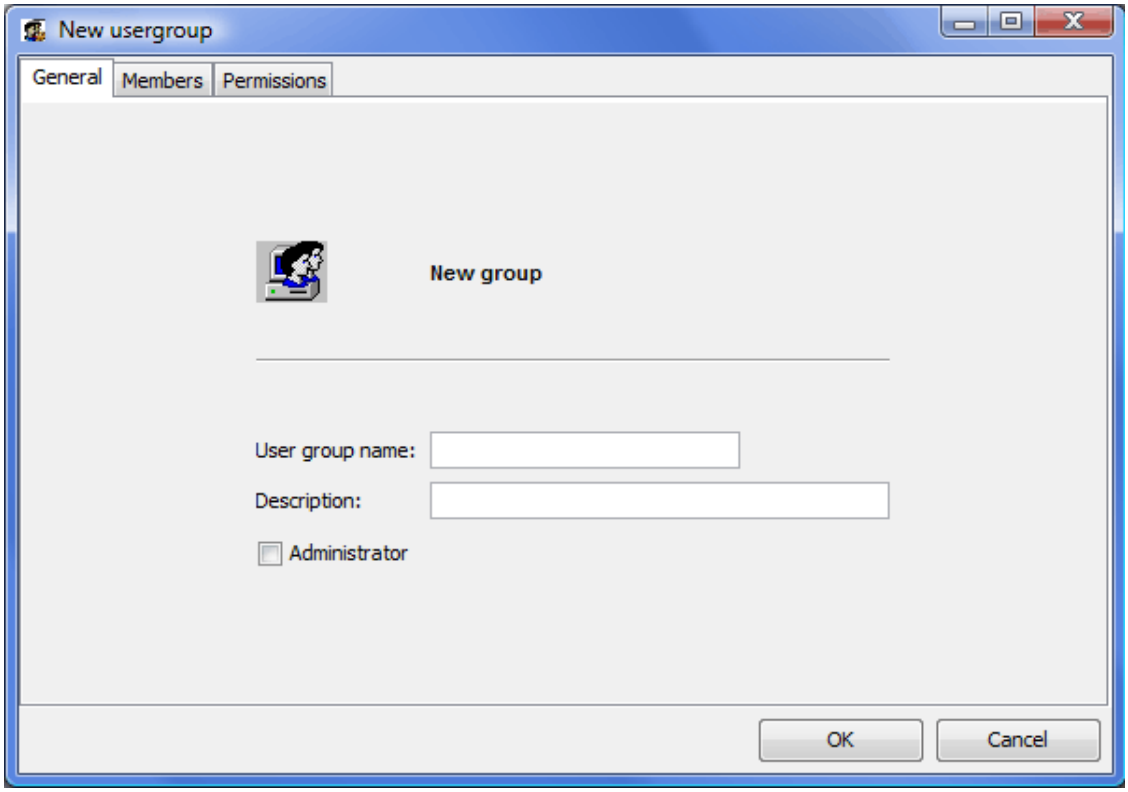
   Select a group by left-click, or CTRL-left-click for multiple groups.

3. Click **OK** to save the modified user properties.

Create User Group

Do as follows to add a new user group to the server:

1. Login to the User Administration Tool.
2. Select **Action↗New↗Group** in the TEMS CellPlanner Administration Window. The New usergroup - General window is displayed as in the example below:



3. Enter a **User group name** and optionally a **Description** for the group.
4. If you want all members of the group to have user administration privileges, select the **Administrator** option. All group members may then login as administrators.
5. To add members to the group, see Define User Group Members on page 16-14.
6. To define permissions for the group, see Set Basic Permissions on page 16-19.
7. Click **OK** to save the user group properties.

Edit User Group Properties

Use this procedure to modify the properties of existing user group.

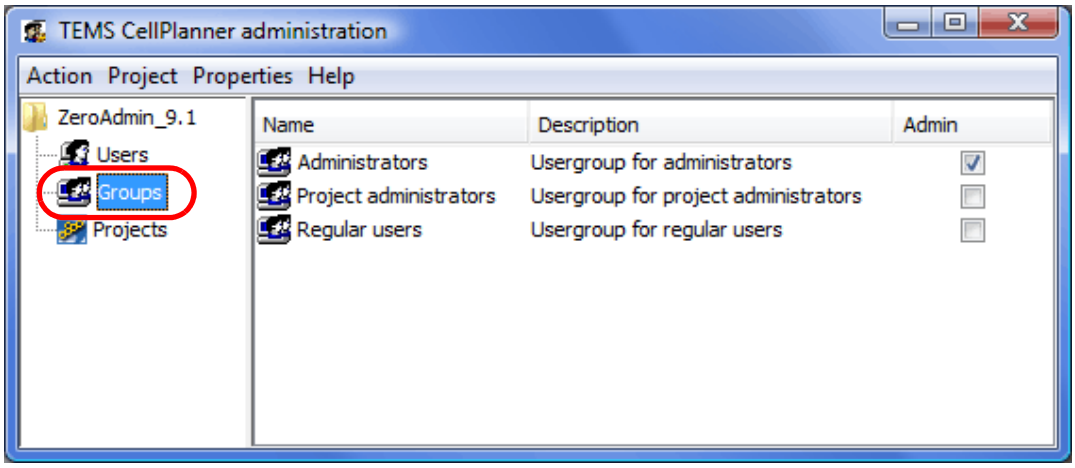
Prerequisites

- The user group to edit is defined, see Create User Group on page 16-12.
- Login to the User Administration Tool.

Procedure

Follow these steps to edit the properties of defined user groups:

1. Click **Groups** in the TEMS CellPlanner Administration Window. The defined user groups are listed on the right side of the window as in the following example:



2. Select the **Admin** option for groups that shall have user administration privileges.
3. Select a group by highlighting its row and right-click and select **Edit**, or double-click. The **Edit user group** window appears.
4. To add or remove members to the group, see Define User Group Members on page 16-14.
5. To modify permissions of the group, see Set Basic Permissions on page 16-19.
6. Click **OK** to save the modified user group properties.

Define User Group Members

Use this procedure to define members of a user group.

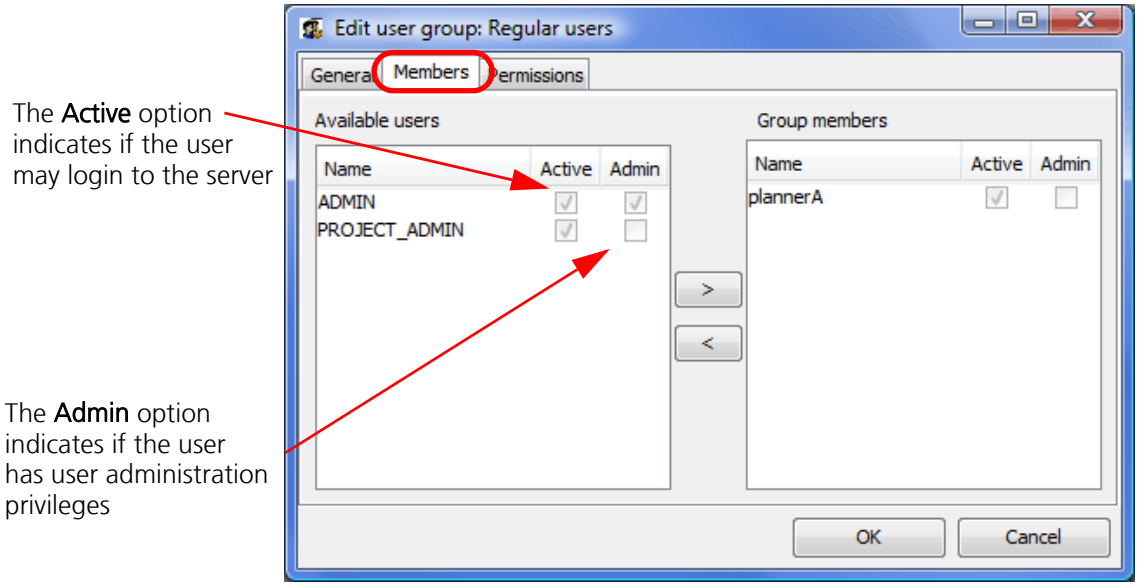
Prerequisites

- Login to the User Administration Tool.
- You have selected a user group, and the **New usergroup** or **Edit user group** window is open, see Create User Group on page 16-12 or Edit User Group Properties on page 16-13.

Procedure

Follow these steps to add users to, or remove users from, a user group:

1. Select the **Members** tab as in the following example:



2. Use the > button to move users from the list of **Available users** to the list **Group members**, and thereby including users in the group.

   Use the < button for the opposite operation.

   Select a user by left-click, or CTRL-left-click for multiple users.

3. Click **OK** to save the modified user group properties.

Projects and Permissions

This section describes how to manage server projects and their permissions.

Assign Project to User Group

Use this procedure to make projects accessible to a user group.

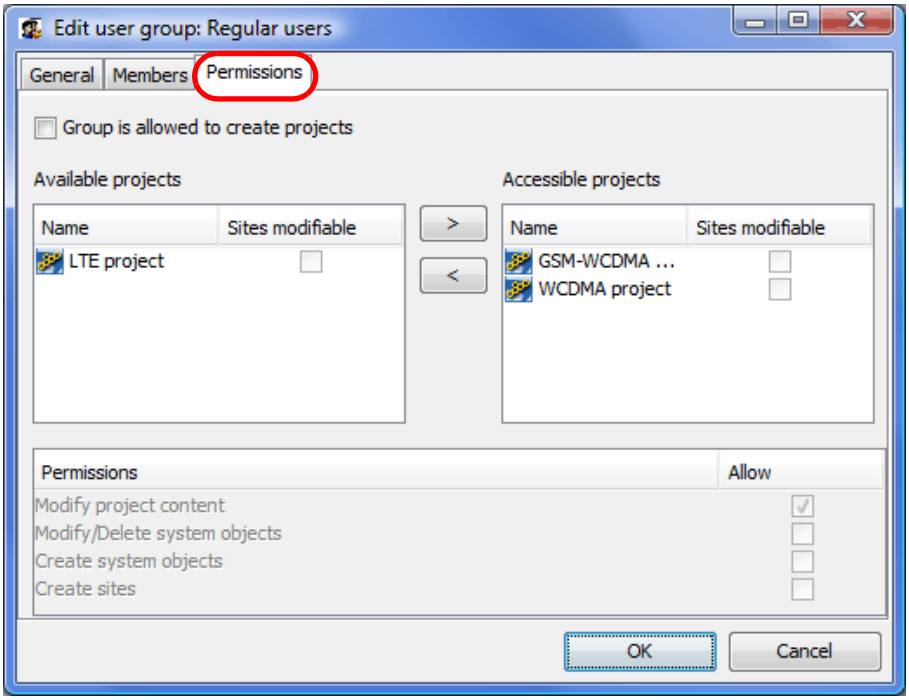
Prerequisites

- Login to the User Administration Tool
- At least one user group is created, see Create User Group on page 16-12
- Projects are stored on server, see Create Project on the Server on page 15-7

Procedure

Do as follows to set a user group's permissions to a specific project:

1. Click **Groups** in the TEMS CellPlanner Administration Window and select the group that shall have access to the project.
2. Select the Permissions tab as in the following example:



3. Use the > button to move **Available projects** to **Accessible projects**, and thereby giving all users of the user group access to **Accessible projects**.

Use the < button for the opposite operation.

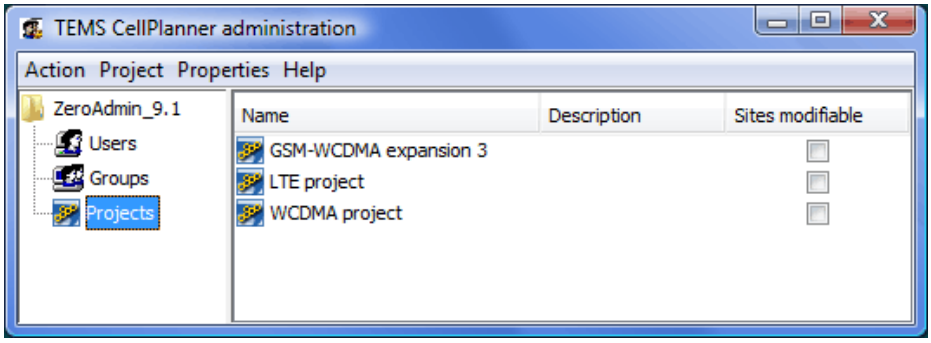
Select a project by left-click, or CTRL-left-click for multiple projects.

Click **OK** to save the modified user group properties.

View Project Permissions

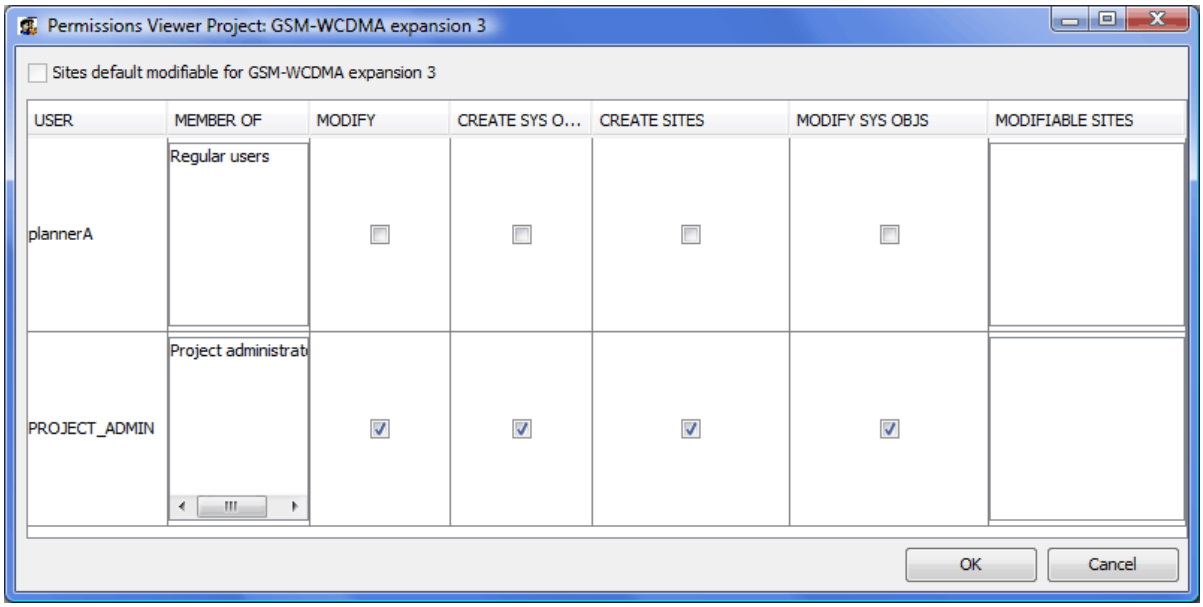
Use this procedure to view which projects have modifiable sites, and to get a summary of the permissions all users have to a selected project.

1. Login to the User Administration Tool.
2. Click **Projects** in the TEMS CellPlanner Administration Window.
   The projects stored on server are listed to the right, as in the following example:



When the option **Sites modifiable** is selected, all users of the project may modify sites in the project, irrespective of individual permissions.

3. Select the project to view, double-click on the project, or right-click and select **Permissions view...** . The **Permissions viewer** window appears as in the following example:



Each row represents a user with project permissions in read-only check boxes.

The option **Sites default modifiable** is valid for all project users.

The table below maps the permission codes in this window and the configurable permissions per user group.

Permission code in window "Permissions viewer"	**Permission name in window "User group - Permissions window"**
Sites default modifiable ...	Corresponds to the option with the same name in the client window **Edit site permissions**, see Set Site Permissions by Individual Site Selection on page 16-21
USER	User
MEMBER OF	User groups to which the user belongs
MODIFY	Corresponds to **Modify project contents**
CREATE SYS OBJ	Corresponds to **Create system objects**
CREATE SITES	Corresponds to **Create sites**
MODIFY SYS OBJS	Corresponds to **Modify/delete system objects**
MODIFIABLE SITES	Lists all sites to which the user has **Modify/Delete** permission

Delete Project from the Server

In earlier versions of TEMS CellPlanner even regular users with special permissions could delete projects from the server. From TEMS CellPlanner 9.1 only administrators have deletion privileges.

When you delete a project, all private workspaces of the project are removed and the project is no longer available for use or administration.

Ensure that possible users of the project are informed before deletion. If anyone is working on the project in a private workspace, he or she will not experience that the project is deleted from the server until trying to publish or refresh.

Caution: Deleting a project from server is irreversible. Ensure that no one needs the project anymore, and that you have a backup if there is any risk that you need to restore it.

Do as follows to delete a project from the database:

1. Login to the User Administration Tool.
2. Click **Projects** in the TEMS CellPlanner Administration Window and select to project to delete in the right side of the window.
3. Select **Action↗Delete** from the menu.
4. If any user has a private workspace for this project, a warning message lists all private workspace(s) and you are prompted to accept or cancel the deletion.

Permissions

Use the procedures in this section to set permissions to projects.

Set Basic Permissions

Use this procedure to make a project accessible to a user group and to set the basic permissions to the project.

To set permissions of an individual user, a dedicated user group must be created with that user as its sole member.

Prerequisites

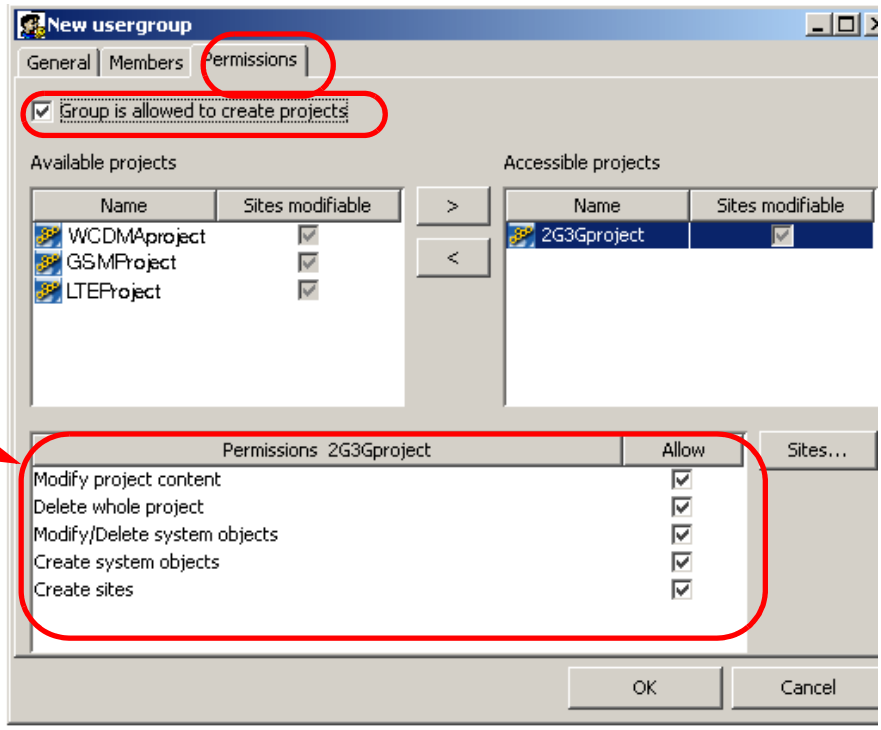
- Read Permissions Overview on page 16-5
- Login to the User Administration Tool
- You have selected a user group and the **New usergroup** or **Edit user group** window is open, see Users and User Groups on page 16-9

Procedure

Do as follows to set a user group's permissions to a specific project:

1. Click **Groups** in the TEMS CellPlanner Administration Window and select the group to grant or deny permissions.

2. Select the **Permissions** tab as in the following example:



3. If the user group shall have privileges to create projects on the server, select option **Group is allowed to create projects**.
4. Select projects for the user group by highlighting and using the arrows. To make projects accessible to the group, select the projects from the list of **Available projects** and move them to **Accessible projects**, and vice versa.
5. Select a project from the list of **Accessible projects**. The group's project permissions are listed in the **Permissions** panel.
6. Grant or deny basic permissions to the project using the **Allow** options. See Permissions Overview on page 16-5. for information on options and initial settings.
7. To set modify/delete sites permissions, proceed with Set Site Permissions by Individual Site Selection on page 16-21 or Set Site Permissions by Filtering Sites on page 16-23.
8. Click **OK** to save the user group properties.

Fields on Window “New user group - Permissions”

Group is allowed to create projects	When selected, allows all members of the user group to create projects on server when logged in from a TEMS CellPlanner client, as described in Create Project on the Server on page 15-7.
Available projects	List of projects possible to make accessible
Accessible projects	List of projects accessible by the user group. These are the only projects possible to select for loading, see Load Workspace from the Server on page 15-8.
>	Makes the selected project(s) accessible to the group
<	Removes access to the selected project(s) for this group
Permission	The basic permissions for the user group and project The options are described in permissions on page 16-4.
Allow	If selected, permissions are granted. If cleared, permissions are denied.
Sites	Enabled if **Modify project content** is selected. Lists sites in a separate window where you can grant or deny access to individual sites of the selected project. See Set Site Permissions by Individual Site Selection on page 16-21.

Set Site Permissions by Individual Site Selection

When a user group initially gets basic permissions, it still has no permissions to modify or delete sites in the project.

To open up the possibility to modify and delete existing sites, you must first give the user **Modify project content** permission, and after that select the sites which the group may modify (or delete).

You can give modify/delete permissions to sites either selected one by one from a list, or by using a filter to select a bunch of sites at the same time.

Use this procedure to grant or deny a user group modify/delete permissions on sites selected one by one from a list.

Note: *This method suits best the case when you have a small number of sites in your network. For a network with a large number of sites, it is more convenient to* Set Site Permissions by Filtering Sites *on page 16-23.*

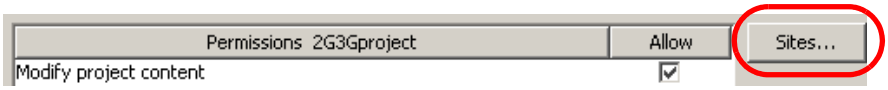
Prerequisites

- **Modify project content** permission is granted for the user group and project, see Set Basic Permissions on page 16-19.
- Login to the User Administration Tool.
- The **Permissions** tab is selected, see Set Basic Permissions on page 16-19.

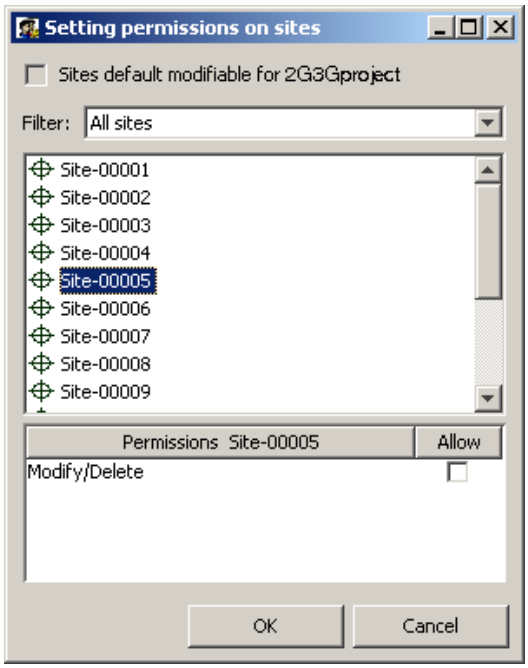
Procedure

Follow these steps to set site permissions for a user group and project:

1. Select a project from the **Accessible projects**. The basic permissions of the project are displayed in the **Permissions** part of the window.
2. Ensure that the **Modify project content permission** is allowed. The **Sites...** button is then enabled as in the following example:



3. Click **Sites...** to open the Setting permissions on sites window, as in the following example:



For details, see Fields on Window "Setting permissions on sites" on page 16-23.

4. Select (highlight) the site for which to change the site permissions. The current site permissions are displayed in the **Permissions** panel at the lower part of the window.
5. Select the **Allow** option to grant modify/delete permissions of selected site(s).
6. Click **OK** to save the site permissions.

Fields on Window "Setting permissions on sites"

(list of sites)	List of sites in the project
Sites default modifiable for <project>	Initially unselected.
Permissions	Displays the user group permissions for the selected sites.
Allow	Indicates that the user group may modify and delete the selected site(s).

Set Site Permissions by Filtering Sites

When a user group initially gets basic permissions, the group still has no permissions to modify or delete sites in the project.

To open up the possibility to modify and delete existing sites, you must first give the user **Modify project content** permission, and after that select the sites which the group may modify (or delete).

You can grant modify/delete permissions to sites either selected one by one from a list, or by using a filter to select a group of sites at the same time.

Use this procedure to grant or deny a user group modify/delete permissions on sites selected by a filter, or by site selection from the map display. As filtering sites and selecting sites from the map display is not possible from the TEMS CellPlanner User Administration tool, you must use this procedure from a TEMS CellPlanner Client.

Note: *To select sites one by one instead of filtering, use* Set Site Permissions by Individual Site Selection *on page 16-21*.

Prerequisites

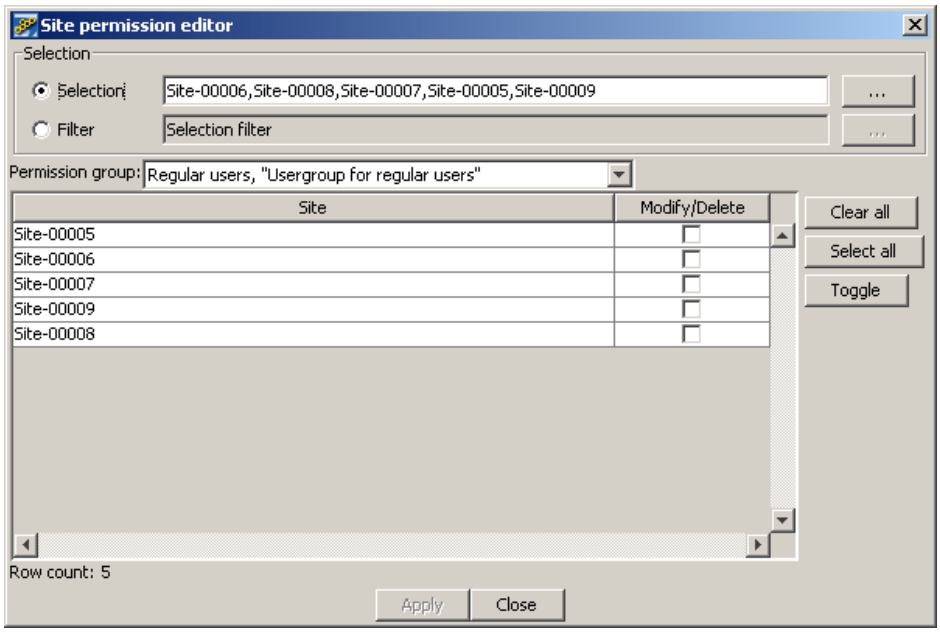
Modify project content permission is granted for the user group and project, see Set Basic Permissions on page 16-19.

Procedure

Follow these steps to set site permissions for a user group and project:

1. Open the TEMS CellPlanner Client.
2. For performance reasons, limit the number of sites to load from the Server by defining a working area comprising the sites for which to set permissions. See User Specific Settings on page 3-16.
3. Login to the Server as administrator.
4. Create Project on the Server to load the shared project.

5. Select **Utilities↗Administer site permissions**. The **Site permission editor** window is displayed as in the following example:



6. Select the sites for which to change the permissions by one of these methods:

   a. Select sites from the map display, see Define Map Area on page 9-36.

   b. Apply a filter, see Filters on page 10-1.

3. In the field **Permission group**, select the user group for which to change the site permissions.

4. Change the modify/delete permissions according to one or more of the following methods:

   - To grant permissions for all sites, click **Select all**
   - To deny permissions for all sites, click **Clear all**
   - To grant (or deny) permissions for a specific site, select (highlight) the site and select (or clear) the **Modify/Delete** option
   - To grant permissions for currently denied sites, and deny permissions to currently granted sites, click **Toggle**.

5. Click **Apply**. Any administrator in the User Administration tool will see the changes first after logging out from the tool and logging in again.

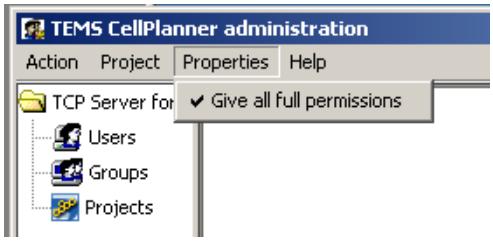
Give Full Permissions to All

Note: *The name of this menu choice is somewhat misleading, as "full permissions" only include basic permissions, which exclude permissions to modify/delete sites.*

The quickest way to remove all restrictions is to give all basic permissions to all user groups for all projects at once, instead of granting permissions per project, user group and permission type.

Do as follows to give basic permissions to all, for all:

1. Login to the User Administration Tool.
2. In the TEMS CellPlanner Administration Window, select **Properties↗Give full permissions**. The setting is marked by a check mark in front of the menu choice as in the following example:



3. As a consequence, no specific permissions can be set - not even viewed - as the **Permissions** tab in the **Edit user group** window can no longer be selected, as in the following example:

See also Create Project on the Server on page 15-7 which also gives all basic permissions, but for selected user groups and limited to a specific project.

17
Interfaces to Other Tools

This chapter describes some tools providing usable data for TEMS CellPlanner, or using data exported from TEMS CellPlanner.

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TEMS Products

TEMS CellPlanner is one of a set of tools in the TEMS product portfolio. While you use TEMS CellPlanner to configure and simulate networks during rollout and expansion, you can use other TEMS tools to capture and analyze measurement data from drive tests and other network surveys of the Live Network.

TEMS CellPlanner can use the measurement data to align its predicted propagation models and pathloss values with measured results, and to display drive test routes with signal strengths along the route.

The other way around, some TEMS tools can use the same cell names and positions as TEMS CellPlanner by importing an XML file exported from TEMS CellPlanner.

This chapter summarizes TEMS CellPlanner's interface to the following TEMS tools:

- TEMS Investigation
- TEMS Automatic
- TEMS Pocket
- TEMS Presentation
- TEMS Discovery

Visit www.ascom.com/networktesting for more information on TEMS products.

TEMS Investigation

TEMS Investigation (TI) stores captured measurement data in log files of extension *.log*, importable into TEMS CellPlanner. See Supported TEMS Investigation Log File Versions and Modes on page 17-3.

Import of TEMS XML Cell Data is supported. The cell data is used to display the same cell names and use the same cell positions as TEMS CellPlanner.

TEMS Automatic

TEMS Automatic stores measurement data in either of the following two ways:

- log files of the same format as TEMS Investigation log files, see Supported TEMS Investigation Log File Versions and Modes on page 17-3
- MS SQL Server database format, so called "TEMS Automatic data. This storage type is used only with TEMS Automatic is in GSM mode. When importing "TEMS Automatic data" into TEMS CellPlanner, the data is fetched from an SQL database on a remote server. See Supported TEMS Automatic Database Versions and Modes on page 17-4.

TEMS Automatic can import TEMS XML Cell Data from TEMS CellPlanner to display cells and lines to serving cells on the map, and to use proper cell names in reports on missing neighbors.

TEMS Pocket

TEMS Pocket stores captured measurement data in log files, see TEMS Investigation.

Import of TEMS XML Cell Data is supported by TEMS Pocket 7.1 and later for Nokia N96, and TEMS Pocket 8.0 and later for Windows Mobile, for the same purpose as in TEMS Investigation.

TEMS Presentation

Import of TEMS XML Cell Data is supported as in TEMS Automatic.

TEMS Discovery

Import of TEMS XML Cell Data is supported as in TEMS Automatic.

Supported TEMS Investigation Log File Versions and Modes

TEMS CellPlanner 9.1 and later can import log files captured by the tool versions and modes listed below.

Microsoft .NET Framework is required to import log files. See *TEMS CellPlanner Installation Guide* for information on required versions and installation instructions.

Supported Log File Versions

TEMS Investigation:	6.x, 7.x, 8.x, 9.x, 10.0, 10.1
TEMS Automatic:	8.0 and earlier (log files only)
TEMS Pocket:	7.x and earlier (log files only)

Data from older versions might be importable, but only the listed versions are verified towards recent versions of TEMS CellPlanner.

Supported Modes

The following types of measurements can be imported to TEMS CellPlanner 9.1:

LTE:	• Scanner mode (dedicated scanner only)
WCDMA:	• UE mode • CPICH scan (UE or dedicated scanner)
GSM:	• UE mode • CW scan (UE or dedicated scanner)

Supported TEMS Automatic Database Versions and Modes

TEMS CellPlanner 9.0.0 and later can import TEMS Automatic GSM data captured by TEMS Automatic 3.x, 4.0, 4.1, or 4.2.

Data from older versions might be importable, but only the listed versions are verified towards recent versions of TEMS CellPlanner.

log files

TEMS Investigation always stores measurement data in log files of extension *.log*. Log files may also be generated by TEMS Automatic and TEMS Pocket.

As TEMS Investigation is the most commonly used tool of these three, this manual refers to "TEMS Investigation log files" for log files created by any of those tools.

The log files must be compatible with the current version of TEMS CellPlanner, see Supported TEMS Investigation Log File Versions and Modes on page 17-3.

You can import log files into TEMS CellPlanner to tune propagation models, display routes, or to puncture pathloss raster data with measurement data. Licenses are required for some processing of measurement data.

The list below shows involved TEMS CellPlanner functions, with license information and links to the relevant procedures:

• Tune Entire Propagation Models	no extra license required
• Tune Sector Models	requires AMI & ASMT license
• Puncture Pathloss with Raw Data	no extra license required
• Puncture Pathloss with Antenna Independent Data	requires AMI & ASMT license (only the AMI functionality is used)
• View Measurement Data in the Map Window	no extra license required
• Plot Cell Measurements from AMI Database	requires AMI & ASMT license (only the AMI functionality is used)

Ericsson OSS-RC

OSS-RC is the Ericsson network management system for radio networks.

You can use TEMS CellPlanner to optimize coverage and performance at expansion or modification of OSS-RC managed WCDMA and GSM networks.

TEMS CellPlanner supports recent versions of Bulk-CM (WCDMA) and CNAI (GSM) configuration data. Read more in the following sections:

- OSS-RC WCDMA Network Data on page 18-25
- OSS-RC GSM Network Data on page 18-11

Actix CellOpt AFP

TEMS CellPlanner supports exchange of GSM frequency plans with Actix CellOpt AFP via export/import of XML files in a format compatible with CellOpt AFP version 3.0.

18
Importing Data

This chapter describes procedures for importing data into TEMS CellPlanner.

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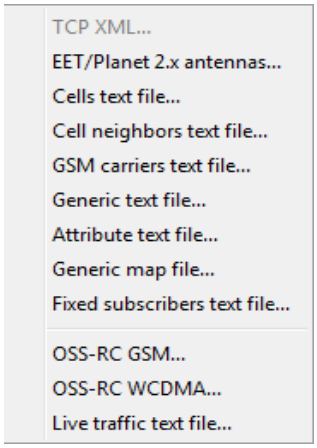
About Importing Data to TEMS CellPlanner

By using the **File↗Import** menu you can import data from other applications:



• TCP XML	TEMS CellPlanner project in XML format
• EET/Planet 2.x antennas	Antenna data in the EET/Planet 2.x format
• Cells text file	Text file with cell data
• Cell neighbors text file	Text file with cell neighbor data
• GSM carriers text file	Text file with GSM carrier data
• Generic text file	Objects in ASCII file format
• Attribute text file	Text file with custom attributes
• Generic map file	Map file with sites and areas defined by polygons
• Fixed subscribers text file	Text file with LTE or WiMAX fixed subscribers
• OSS-RC GSM	CNAI file with GSM network data from OSS-RC
• OSS-RC WCDMA	Bulk CM file with WCDMA network data from OSS-RC
• Live traffic text file	Text file with live traffic

Supported File Formats and Source Applications

TEMS CellPlanner can import the following file formats:

- Vector map information files in `.MIF` format, output from MapInfo™
- XML files
- ASCII files
- Live traffic files

.. and network configurations from the following applications:

- OSS-RC
- WCDMAplanner
- EET/Planet

Project XML Files

A TEMS CellPlanner project can be saved either in TEMS CellPlanner proprietary format or in readable XML format. If you want to use a project in another TEMS CellPlanner version than the one used when saving the project, you must export the project in XML format from the original version and import the XML file into the new version. There are two ways of importing projects in XML format:

- Import Project XML Files to TEMS CellPlanner Client.
  This is the most common case, used when projects are stored on the local computer or on a Citrix server.
- Import Project XML Files to TEMS CellPlanner Server.
  This is the most practical method for an authorized administrator to import projects to a TEMS CellPlanner Server. The XML file may include multiple projects and account information of migrated users.

Import Project XML Files to TEMS CellPlanner Client

Use this procedure to import a TEMS CellPlanner project from an XML file and store as a project file in the file system of a TEMS CellPlanner Client (or Citrix server).

Account information - project users, user groups and permissions - is not imported even if present in the XML file.

If the project to import shall be stored in database, follow instead the instructions in Import Project XML Files to TEMS CellPlanner Server.

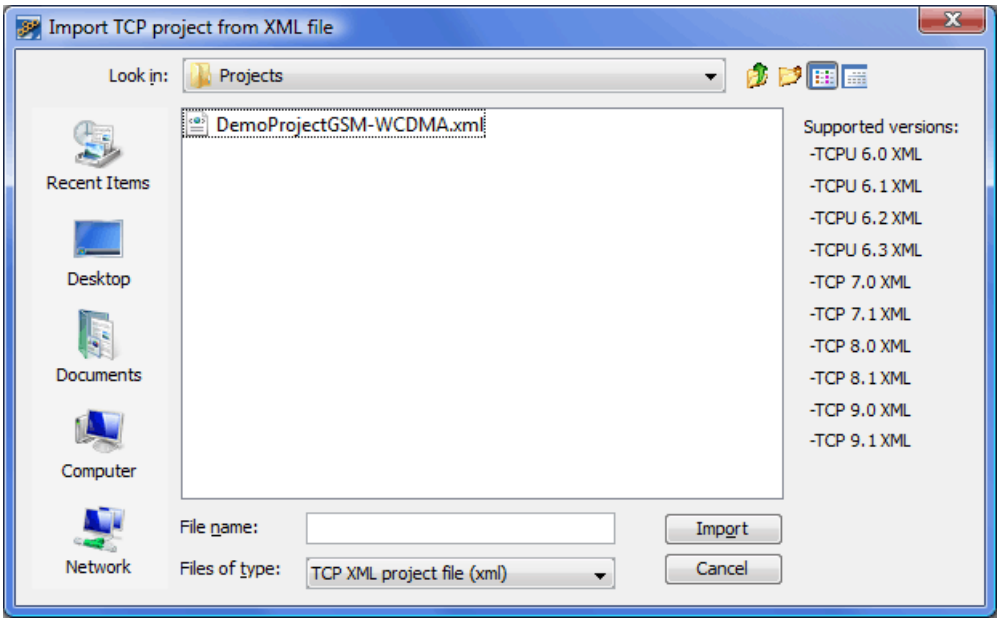
Prerequisites

You have access to an XML file with the TEMS CellPlanner project to import.

Procedure

To import a project to a project file in the file system of a TEMS CellPlanner Client, do as follows:

1. Select **File↗Import↗TCP XML**. The **Import TCP project from XML file** window is displayed as in the example below. The supported versions for importing are displayed on the right side of the window.



2. Select a file and click **Import**. The file is imported and the project is displayed in the map window. The project gets its name from the XML file - not from the file name itself.
3. If you want to rename the project, select **File↗Project settings** and enter another name.
4. From **File↗Project settings** you may also change the name of the calculation results directory and the map layers for the project.
5. If you want to save the project as a project file, select **File↗Save as**, enter a file name and click **OK**.

Import Project XML Files to TEMS CellPlanner Server

Use this procedure to import TEMS CellPlanner projects from XML files, and create the projects in database. You may import several projects at the same time.

If the file to import was created as a result of Export Projects in Database from TEMS CellPlanner Server it might include account information, that is, users, user groups and permissions associated with the exported project.

If the file to import instead was created as a result of Export Project Files from TEMS CellPlanner Client, it does not contain any account information.

Each imported file results in a project stored in the database, and if account information was included in the import, the users and user groups are created and permissions set in the TEMS CellPlanner Server.

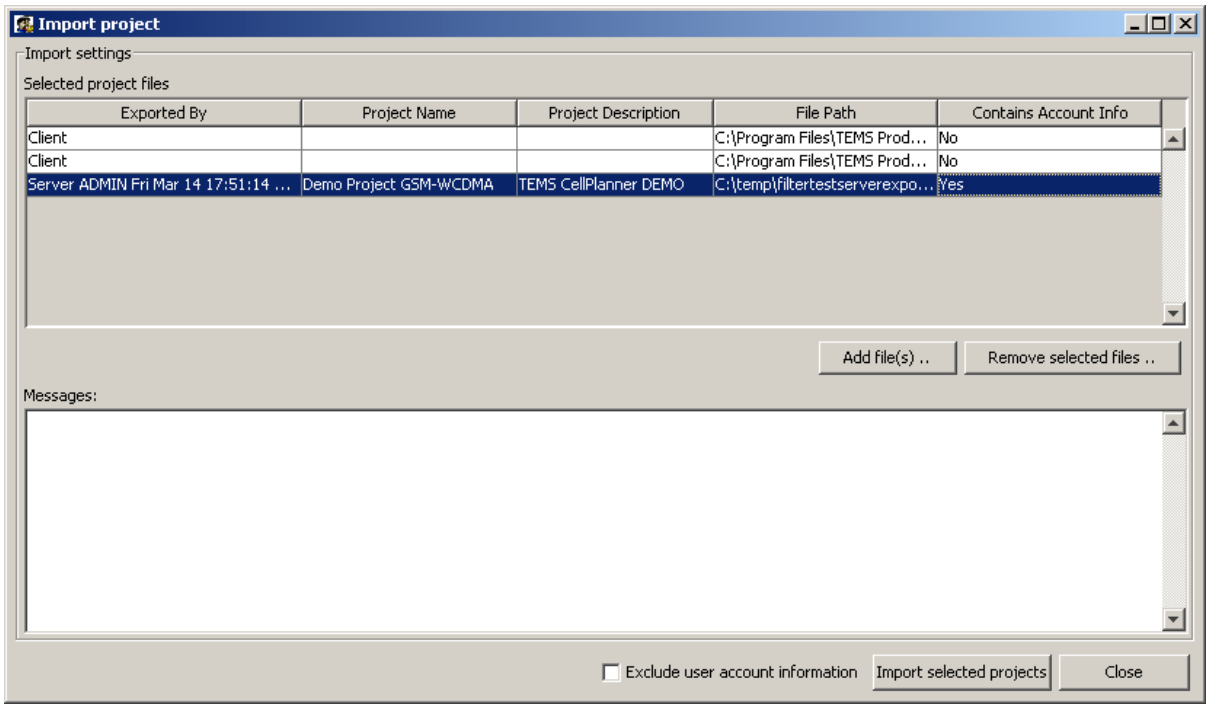
Prerequisites

- You are an authorized administrator of the TEMS CellPlanner Server.
- An XML file containing a previously exported project is available.
- The TEMS CellPlanner Server is started.

Procedure

To import a project to store in the database, optionally with account information to store in the TEMS CellPlanner Server, do as follows:

1. Login to the User Administration Tool.
2. From the **Project** menu, select **Import Project**. The **Import project** window is displayed as in the following example:



See Fields on Window "Import project" on page 18-7.

3. Click **Add file(s)**. A browser window appears.
4. Select the project XML file to import and click **OK**. The project is added to the list of **Selected project files**.

   Note: *Projects in database must have unique names. If you attempt to import a project already created in the database, the import will fail.*

5. To remove projects from the list, highlight the projects and click **Remove selected files**.
6. Repeat from Step 3 until all projects to import have been added to the list.
7. To start the import, click **Import selected projects**. All projects in the list are imported. A progress status dialog with one bar per project displays the status of the import.

   Note: *You can't import a selection of projects by highlighting them in the list. Selection by highlight can only be used to remove projects from the list.*

8. When the import is completed, the selected project(s) are imported and created in database, with the same project name as in the XML file. If the imported file(s) include account information, not yet defined users and user groups are created in the TEMS CellPlanner Server, and permissions are set.
9. If you want to rename a project, do this from the TEMS CellPlanner Client.

Fields on Window "Import project"

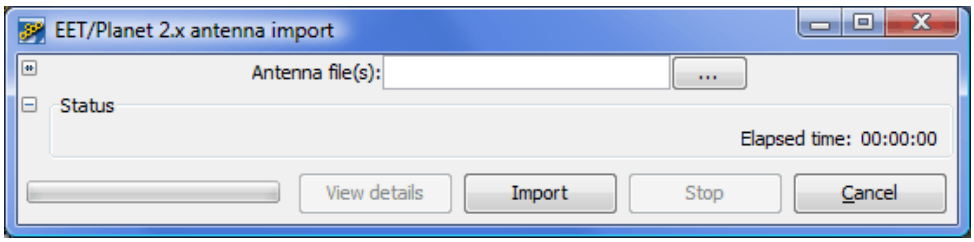
Exported by	Indicates if the XML file was exported from a TEMS CellPlanner Client or a TEMS CellPlanner Server. If exported by a TEMS CellPlanner Server, this field also displays the id of the exporting user, the date and TEMS CellPlanner version at the export.
Project name	Name of the project, included in the XML file. Present only if exported by TEMS CellPlanner Server.
Project description	Free text description of the project. Present only if exported by TEMS CellPlanner Server.
File path	Path of the XML file.
Contains account info	No - The file was exported by a TEMS CellPlanner Client, or account information was not included in the export from a TEMS CellPlanner Server. Yes - Account information was included in the export from a TEMS CellPlanner Server.
Add file(s)	Adds files to the list Selected project files.
Remove selected files	Removes files from the list Selected project files.
Exclude user account information	If selected, no account information will be imported, even if present in the files the import.
Import selected projects	Imports projects listed in Selected project files.
Messages	Result of the import.

Antenna Files

Import EET/Planet 2.x Antennas

Do as follows to import EET/Planet 2.x antenna data into an open project:

1. Select **File↗Import↗EET/Planet 2.x antenna import.** The **EET/Planet 2.x antenna import** window appears as in the following example:

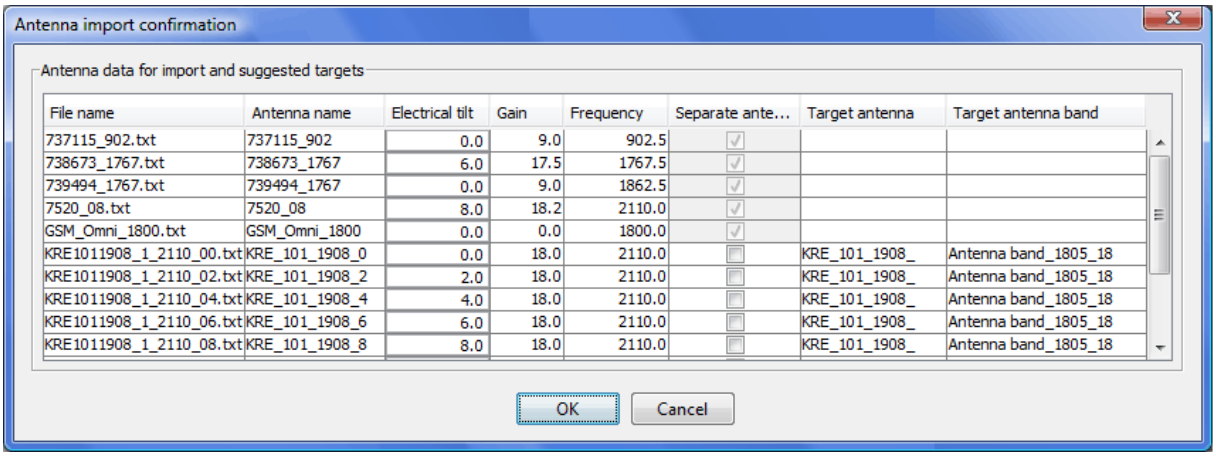


2. Click ... to display a list of antenna files.
3. Select files. The selected files are listed in the **Antenna file(s)** field.
4. Click **Import**.

   Here you might be prompted to select a frequency band for the selected antenna types. The import function uses the **Frequency** and **Gain** parameters in the antenna files to determine if new antenna bands need to be created in the target antenna. If you must select a frequency band but none is defined you can define it now by clicking the **Add** button.

   Select a TEMS CellPlanner frequency band matching the **Frequency** in the antenna file(s) and click **OK**.
5. The import begins and the **Status** bar shows the progress of the import.
6. Before the import completes, the **Antenna import confirmation** window appears.
7. In this window, review the list of antennas and indicate if any should be imported as a **Separate antenna**. See description of parameter **Target antenna** in Fields on Window "Antenna import confirmation" on page 18-9.

The result might look as in the following example:



8. Click **OK**. The import completes and messages are displayed if antennas are renamed or not imported.
9. Click **View details** to view the result of the import.

Fields on Window "Antenna import confirmation"

File name	Name of the file, excluding path
Antenna name	Name as defined in the antenna file
Electrical tilt	The default electrical tilt is obtained from the vertical angle with the lowest loss in the antenna file. An EET/Planet 2.x antenna file does not contain any electrical tilt parameter for the horizontal and vertical lobe patterns.
Gain	Gain as defined in the antenna file
Frequency	Frequency as defined in the antenna file
Separate antenna	Select if the antenna file shall be imported into a separate target antenna instead of to the suggested target antenna. See Target antenna.

Target antenna	Each selected file is assigned a suggested target antenna to which the antenna - or antenna lobe - can be imported. The EET/Planet 2.x antenna file format specifies that each file can contain only data for one antenna lobe per file. The physical antennas can have different electrical tilt settings, and each electrical tilt setting has its individual antenna lobe pattern. To avoid that antenna lobes are treated as different antennas, TEMS CellPlanner suggests one target antenna for all lobes (files) of that antenna. Several EET/Planet 2.x antenna files can be imported into one single antenna with several electrical tilts. The antenna import function uses the **Name** parameter in the EET/Planet 2.x antenna files to determine if two or more files contain data for the same antenna. The comparison is made both with any other files selected for import, as well as with existing antennas in the current project.
Target antenna band	Syntax: Antenna band_x_y, where • x = base frequency of the frequency band • y = **Gain**

OSS-RC GSM Network Data

Importing GSM Network Data from OSS-RC

By OSS-RC GSM Import you can populate a TEMS CellPlanner project with sites, equipment and cell data from a live GSM network managed by OSS-RC.

Importing the network data from OSS-RC allows you to audit, tune or optimize an existing GSM network, or to plan a network expansion in TEMS CellPlanner. The planned changes can be deployed in the live network using OSS-RC GSM Export.

You can either import the OSS-RC data into a new TEMS CellPlanner project or update an existing TEMS CellPlanner project with the live network data. You can choose to import all parameters from the live network or only some selected ones.

The differences between the live network and the TEMS CellPlanner project will be presented to you and you can choose to import everything or disregard some of the changes. You can save the differences in a report that can be loaded into Excel.

About CNAI Files

The file format of OSS-RC GSM network data is *CNAI* (Cellular Network Administration Interface) format; hence the import method is also named *CNAI import*.

Two versions of CNAI file format

OSS-RC provides two different versions of the CNAI file format: "old" CNAI format and "new" CNAI format. The two formats convey exactly the same information but they look completely different and are not compatible with each other.

Note: *TEMS CellPlanner supports the "new" CNAI format only. Earlier releases of TEMS CellPlanner supported the "old" CNAI format. In TEMS CellPlanner 9.0 the OSS-RC GSM Import/Export was redesigned and it now supports the "new" CNAI format. CNAI files used with TEMS CellPlanner 8.1 and earlier versions cannot be imported to TEMS CellPlanner 9.0 and higher versions.*

How to Obtain a "New" CNAI File from OSS-RC

Use the following shell command on the OSS-RC server to export a "new" CNAI file from the Valid Area:

```
cnai export valid -i > filename
```

Note: *The shell command used for "new" CNAI files is different from the one used for "old" CNAI files. It is important to use the right shell command to obtain a file of the correct format.*

Where to Read More

For more details on the "new" CNAI file format, see the OSS-RC CPI document *CNAI, CNA Interface Interwork Description, 1/155 19-APR 901 0143*.

Note the 1/ prefix in the document number. The same document number without prefix is the description of the "old" CNAI file format.

For more details on how to export CNAI files from OSS-RC, see the OSS-RC CPI document *CNAI, CNA Interface, User Guide, 1/1553-APR 901 0143.*

Note: *"New" CNAI is simply called "CNAI" in the OSS-RC CPI, while "old" CNAI is called "old CNAI".*

Supported GSM RAN Versions

TEMS CellPlanner 9.0 supports GSM BSC versions R10 through R12, and 06A through 09A.

OSS-RC GSM Import stores the BSC version as a Custom attribute in each imported BSC.

What Can Be Imported

The following OSS-RC objects can be imported from the CNAI file:

- Subnetwork
- BSC
- SITE
- TG (Transceiver group)
- INTERNAL_CELL (GSM cell)
- OVERLAID_SUBCELL
- CHANNEL_GROUP
- NREL (GSM neighbor relation)
- UTRAN_NREL (UTRAN neighbor relation)

For a detailed list on the parameters that can be imported, see *Parameters to import* in Fields on Window "Import OSS-RC GSM network data" on page 18-18.

Importing UTRAN Neighbor Relations

UTRAN_CELLs from the CNAI file are mapped to existing UTRAN cells in the TEMS CellPlanner project. The Cell Global Identity (CGI) is used to identify the corresponding UTRAN cell in the project:

CGI = PLMN ID + RNC ID + Cell ID

where

PLMN ID = MCC + MNC + MNC length (from Plmn)

Note: *A UTRAN neighbor relation (UTRAN_NREL) will be imported only if the target UTRAN cell already exists in the TEMS CellPlanner project. OSS-RC GSM Import will not create any new UTRAN cells.*

Limitations of CNAI Import

Antenna Types

The antenna type parameter in CNAI only indicates whether an antenna is OMNI, SECTOR or ADAPTIVE. There is no information on the antenna product number or antenna pattern. Therefore, the user must assign an appropriate TCP antenna type for each OSS-RC/CNAI antenna type before starting the CNAI import.

Mapping Cells to Sites

There is no direct association between INTERNAL_CELLs and SITEs in CNAI. An INTERNAL_CELL, via its CHANNEL_GROUPs, can be connected to one or more TGs (Transceiver groups), which, in turn, can be connected to a SITE. To identify the SITE for a particular INTERNAL_CELL, one must to follow the links INTERNAL_CELL→CHANNEL_GROUP→TG-->SITE.

If any of the above mentioned links is broken, there is no way to know which SITE the INTERNAL_CELL belongs to. The import function will make a qualified guess, but it cannot be guaranteed that the cell will end up under the correct site.

Note: *For best possible import results, you should make sure that the configuration of INTERNAL_CELL→ CHANNEL_GROUP→ TG→ SITE is complete and correct for each INTERNAL_CELL in OSS-RC.*

Mapping Transceiver Groups to RBSs

The CNAI file contains no information on RBSs, only Transceiver Groups. An Ericsson RBS can contain 1 to 3 Transceiver Groups. If there is more than one Transceiver Group on a Site, there is no way for TEMS CellPlanner to know if all TGs are part of the same RBS or if there is more than one RBS on the Site. TEMS CellPlanner will simply assume that all Transceiver Groups on the same Site belong to the same GSM RBS.

Geographical Information in CNAI File

Geographical information, such as site/antenna position, height above ground, azimuth are not always set by operators in OSS-RC. Therefore, these parameters might be missing from the CNAI file.

If you are importing new sites, whose geographical position is not defined in OSS-RC, the latitude/longitude of these sites will be set to default value (N 0°0' 0'', E 0°0' 0''). That is, in the map view, these sites will be located at the intersection of the Equator and the Greenwich meridian. Therefore, you need to update these sites with correct geographical parameters after the CNAI import (for example using cell text import).

As the geographical information is usually more accurate in TEMS CellPlanner than in OSS-RC, the geographical parameters are only imported for new sites/antennas. The position, height and azimuth of *existing* sites/antennas are never modified by CNAI import.

Information Not Supported in CNAI

The following information is not present in the CNAI file, and therefore cannot be imported from OSS-RC:

- Feeder cables and feeder cable attenuations
- TMAs and TMA attenuations/gains
- Electrical antenna tilt

CNAI Objects Not Supported in TEMS CellPlanner

FOREIGN_CELLs (GSM cells in an external subnetwork) are not supported. A GSM neighbor relation (NREL) to a FOREIGN_CELL will not be imported.

MSC and its contained objects are not supported.

Process: How to Import GSM Network Data from OSS-RC

Follow this process to import CNAI files exported from OSS-RC:

❶ Preparations Before CNAI Import

❷ CNAI Import, Part I: Read CNAI File

❸ CNAI Import, Part II: Compare, Select and Import

❹ Post-Checks After CNAI Import

Preparations Before CNAI Import

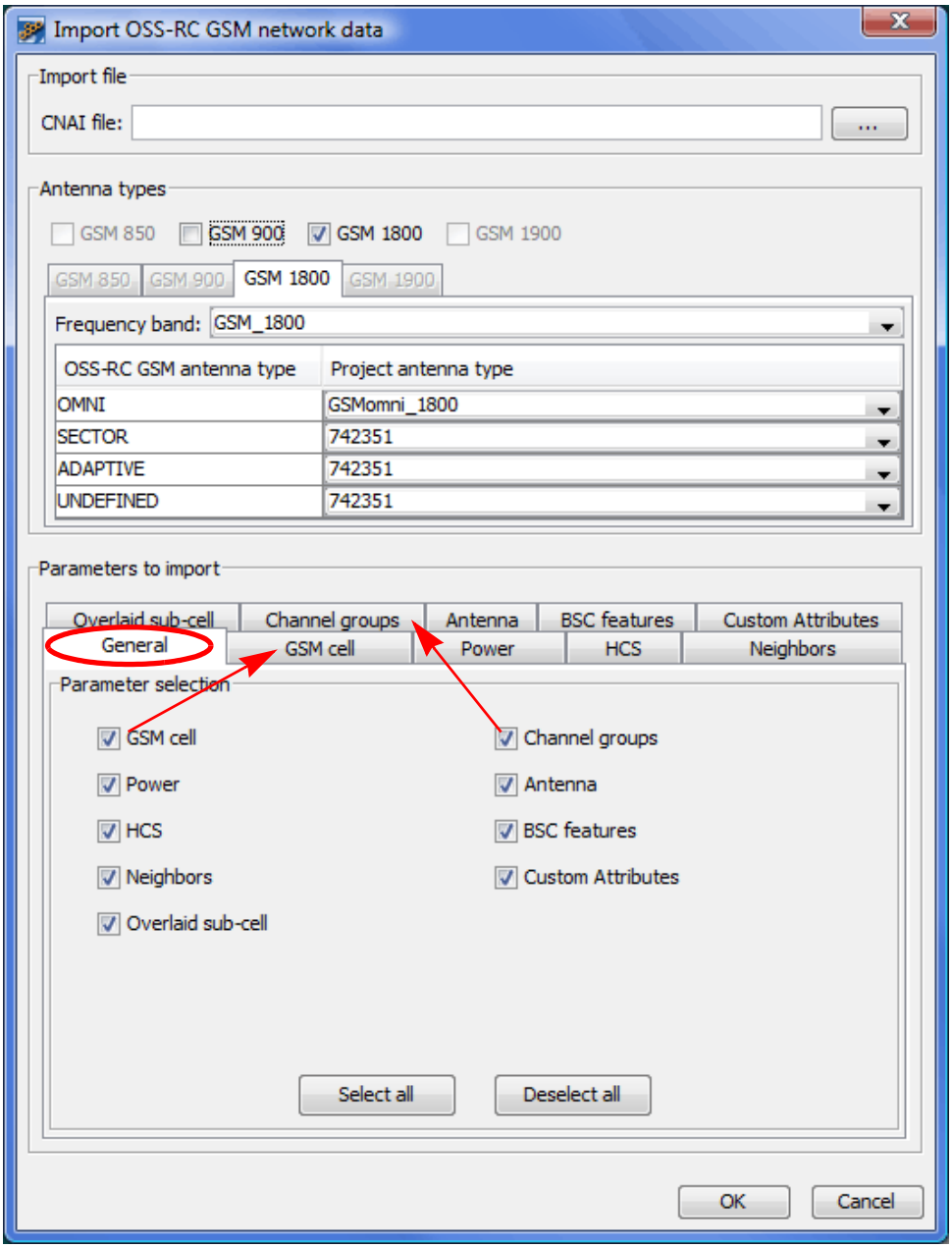
Before importing the CNAI file, you must do the following:

1. Optional: Acquire information about what antenna types are used in the network.
2. Load an existing TEMS CellPlanner project or create a new project.
3. Ensure that the relevant GSM frequency band(s) is(are) defined in the project. See Frequency Bands on page 5-7.
4. Ensure the relevant antenna types are defined in the project. You can import antenna types using Import EET/Planet 2.x antennas.
5. Optional: Define a relevant Feeder cable type and TMA type in the project.
6. Ensure project consistency, see Check Project Consistency on page 3-22.
7. Save the project.

CNAI Import, Part I: Read CNAI File

After Preparations Before CNAI Import, do as follows to initiate the CNAI import:

1. Select **File↗Import↗OSS-RC GSM**. The Import OSS-RC GSM network data window with its General tab appears as in the example below:



See Fields on Window "Import OSS-RC GSM network data" on page 18-18 for details on the window.

2. Select the CNAI file to import.
3. Select the relevant GSM frequency band(s) for the network to import.

4. Select the relevant project antenna types for OMNI, SECTOR, ADAPTIVE and UNDEFINED, respectively.

   Note: *Repeat this for each GSM frequency band selected above.*

5. From the **General** tab, select the parameter groups you wish to import, for example GSM cell, Power, HCS, and so on. The corresponding tabs become enabled and all their parameters are selected.
6. Select or deselect individual parameters under each tab. By default all parameters on an enabled tab are selected, and all parameters on a disabled tab are unselected.

   Note: *Only the selected parameters will be imported from the CNAI file. The unselected parameters will not be modified in the project.*

7. Click **OK**. TEMS CellPlanner reads the CNAI file and compares the data with the current project.

   Note: *The CNAI data is not yet imported into the project.*

Proceed with CNAI Import, Part II: Compare, Select and Import on page 18-22.

Fields on Window "Import OSS-RC GSM network data"

CNAI file	Name of the CNAI file to import.
Antenna types	
GSM 850	Selects the GSM 850 band for import. The checkbox is only available if there is a GSM 850 Frequency Band defined in the System Explorer. If the checkbox is selected, the corresponding tab is enabled. See All tabs below.
GSM 900	Selects the GSM 900 band for import. The checkbox is only available if there is a GSM 900 Frequency Band defined in the System Explorer. If the checkbox is selected, the corresponding tab is enabled. See All tabs below.
GSM 1800	Selects the GSM 1800 band for import. The checkbox is only available if there is a GSM 1800 Frequency Band defined in the System Explorer. If the checkbox is selected, the corresponding tab is enabled. See All tabs below.
GSM 1900	Selects the GSM 1900 band for import. The checkbox is only available if there is a GSM 1900 Frequency Band defined in the System Explorer. If the checkbox is selected, the corresponding tab is enabled. See All tabs below.
All tabs	• Frequency band: Select an appropriate project Frequency band • OSS-RC GSM Antenna type: pre-defined antenna types used in the CNAI file: OMNI, SECTOR, ADAPTIVE and UNDEFINED. These fields are not editable. • Project antenna type: Select a relevant project antenna type for each OSS-RC GSM antenna type. ***Note:*** *Frequency Band and Project antenna types must be selected on each enabled tab.*
Parameters to import	

General tab

Select groups of OSS-RC parameters to import:

- GSM cell
- Power
- HCS
- Neighbors
- Overlaid sub-cell
- Channel groups
- Antenna
- BSC features
- Custom attributes

If a parameter group is selected, then the corresponding window tab is enabled and all parameters on that tab are automatically selected for import. If a parameter group is unselected, then the corresponding window tab is disabled and all parameters on that tab are automatically unselected.

- Select all - Selects all parameters in all parameter groups
- Deselect all - Unselects all parameters in all parameter groups

Note: *When importing new sites/cells into the project, the Channel groups checkbox shall always be selected, otherwise TEMS CellPlanner will not be able to map the GSM cells to sites. See* Limitations of CNAI Import *on page 18-13*.

All tabs except General

- Select all - Selects all parameters in the current tab window
- Deselect all - Unselects all parameters in the current tab window

GSM cell tab

Select GSM cell parameters to import:

- Cell ID
  Selects/deselects INTERNAL_CELL parameter *CI*.
- Max timing advance (TA)
  Selects/deselects INTERNAL_CELL parameter *TAOL*.
- Extended range
  Selects/deselects INTERNAL_CELL parameter *XRANGE*.
- GPRS enabled
  Selects/deselects INTERNAL_CELL parameters *GPRSSUP and SCALLOC*.
- MCC
  Selects/deselects INTERNAL_CELL parameter *MCC*.
- MNC
  Selects/deselects INTERNAL_CELL parameter *MNC* and BSC parameter *MNCDIGITHAND*.
- Location area (LAC)
  Selects/deselects INTERNAL_CELL parameter *LAC*.
- BCC
  Selects/deselects INTERNAL_CELL parameter *BCC*.
- NCC
  Selects/deselects INTERNAL_CELL parameter *NCC*.
- Permitted NCCs
  Selects/deselects INTERNAL_CELL parameter *NCCPERM*.
- Copy BCC to TSC
  Selects/deselects INTERNAL_CELL parameter *CP_BCC_TSC*.

Power tab	Select power parameters to import: • Tx power Selects/deselects INTERNAL_CELL parameter *BSTXPWR* • Power offset Selects/deselects INTERNAL_CELL parameter *SSOFFSETDL* • Power control enabled Selects/deselects INTERNAL_CELL parameter *DYNBTSPWR_STATE* • DTX enabled Selects/deselects INTERNAL_CELL parameter *DTXD* • Min Rx level Selects/deselects INTERNAL_CELL parameter *ACCMIN*
HCS tab	Select HCS parameters to import: • HCS bands Selects/deselects BSC parameter *HCSBAND* • HCS band thresholds Selects/deselects BSC parameter *HCSBANDTHR* • HCS layers Selects/deselects BSC parameter *LAYER* • HCS layer thresholds Selects/deselects BSC parameter *LAYERTHR*
Neighbors tab	Select the neighbor relations to import: • GSM neighbors Selects/deselects NREL (GSM neighbor relations). • UTRAN neighbors Selects/deselects UTRAN_NREL (UTRAN neighbor relations), RNC and UTRAN_CELL. ***Note:*** *The **UTRAN neighbors** option is selectable only if you have a WCDMA license and have selected WCDMA in the Application Preferences.*
Overlaid sub-cell tab	Select overlaid sub-cell parameters to import: • Tx power Selects/deselects OVERLAID_SUBCELL parameter *BSTXPWR* • Max pathloss threshold Selects/deselects OVERLAID_SUBCELL parameter *LOL* • Power offset Selects/deselects OVERLAID_SUBCELL parameter *SSOFFSETDL* • Max timing advance (TA) Selects/deselects OVERLAID_SUBCELL parameter *TAOL*

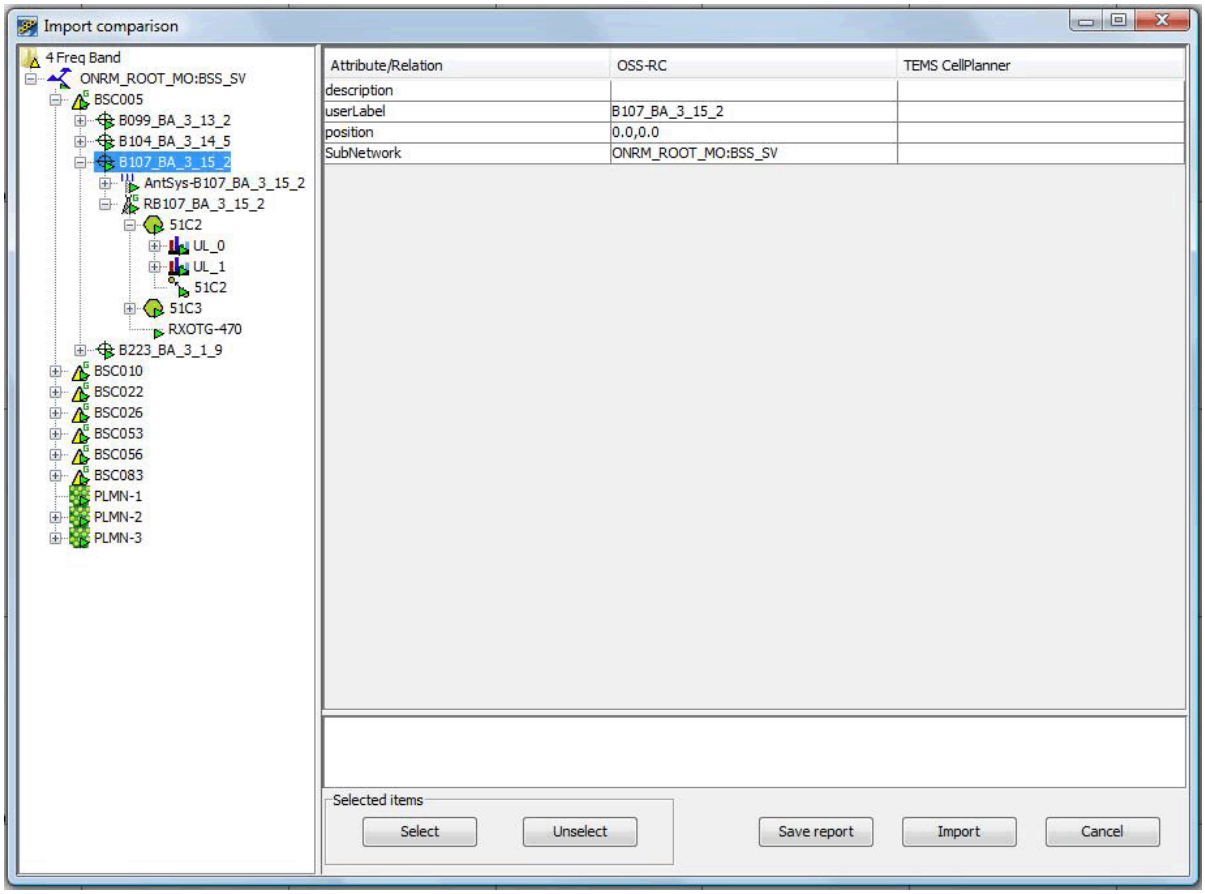
Channel groups tab	Select channel group parameters to import: • BCCH carrier Selects/deselects INTERNAL_CELL parameter *BCCHNO* • TCH carriers Selects/deselects CHANNEL_GROUP parameters *DCHNO*, *HOP* and *NUMREQBPC* alt. INTERNAL_CELL parameter *DCHNO* • Timeslot GPRS CS3 and CS4 Selects/deselects CHANNEL_GROUP parameter *NUMREQCS3CS4BPC* • Timeslot EGPRS Selects/deselects CHANNEL_GROUP parameter *NUMREQEGPRSBPC* • HSN Selects/deselects CHANNEL_GROUP parameter *HSN* • MAIO Selects/deselects CHANNEL_GROUP parameter *MAIO* • TSC System version, thus CNAI format (new or old), dependant parameter selection. - Selects/deselects CHANNEL_GROUP parameter *TSC* ("new") - Selects/deselects INTERNAL_CELL parameter *TSC* and OVERLAID_SUBCELL parameter *TSC* ("old")
Antenna tab	Select antenna parameters to import: • Mechanical downtilt System version, thus CNAI format (new or old), dependant parameter selection. - Selects/deselects INTERNAL_CELL parameter *ANTENNA_TILT* ("new") - Selects/deselects INTERNAL_CELL parameter *TILT* ("old")
BSC features tab	Select the BSC optional features to import: • HCS enabled in BSC Selects/deselects BSC parameter *OF_HCS* • HCS band enabled in BSC Selects/deselects BSC parameter *OF_HCSBAND* • GPRS enabled in BSC Selects/deselects BSC parameter *OF_GPRS* • GPRS CS3 and CS4 Selects/deselects BSC parameter *OF_GPRSCS3CS4* • MAIO enabled in BSC Selects/deselects BSC parameter *OF_MAIO*.
Custom Attributes tab	Select Custom attributes to import: • Max number of internal cells Selects/deselects BSC parameter *INTCELLNO* • Max number of internal neighbor relations Selects/deselects BSC parameter *INTHANDOVERNO* • Max number of external cells Selects/deselects BSC parameter *EXTCELLNO* • Max number of external neighbor relations Selects/deselects BSC parameter *EXTHANDOVERNO* • Max number of UTRAN cells Selects/deselects BSC parameter *UTRANEXTCELLNO* • Max number of UTRAN neighbor relations Selects/deselects BSC parameter *UTRANNRELNO* • Vendor Selects/deselects BSC parameter *VENDOR*

CNAI Import, Part II: Compare, Select and Import

After the CNAI file is read into TEMS CellPlanner, do as follows to select the objects to import and perform the actual import:

8. When the file reading completes, the **Import comparison** window appears, showing the differences between the CNAI file and the current TEMS CellPlanner project, as in the example below.

   Note: *Only the parameters selected for import are compared and displayed.*



See Fields on Window "Import comparison" on page 18-23 for a detailed description of the window.

9. By default, all objects in the tree are selected for import. If you wish to exclude any objects from the import, highlight them and click **Unselect**. All objects in the sub-tree below the deselected object are automatically deselected. The deselected objects are grayed out.

10. To make a deselected object selected again, highlight it and click **Select**. All objects in the sub-tree below the selected object are automatically selected.

11. Click **Import**. The selected objects with parameters are imported into the project.

Proceed with Post-Checks After CNAI Import on page 18-24.

Fields on Window "Import comparison"

Tree-view on the left side of the window	Displays the objects that are about to be created or modified in the TEMS CellPlanner project. The tree hierarchy reflects the network structure used in OSS-RC, similar to the one used in the TEMS CellPlanner Network explorer. The symbols on each object in the tree-view indicates the object status, see Symbols in the "Import comparison" Window on page 18-23. All objects in the tree-view are initially selected for import.
Upper right side of the window	Displays parameter names (Attribute/Relation) and values for the objects highlighted in the tree-view. The parameter values in the CNAI file (OSS-RC) and in the project (TEMS CellPlanner) are displayed side-by-side. *Note:* • *Only the parameters selected for import are compared and only those that are actually found different in the CNAI file compared to the project are displayed.* • *The parameter names used in this window are the names from the TEMS CellPlanner Information Model, not from OSS-RC.*
Select	Selects the highlighted object and its sub-objects in the tree-view.
Unselect	Deselects the highlighted object and its sub-objects in the tree-view. The objects will be grayed out.
Save report	Saves the result of the comparison as a tab delimited text file that can be loaded into Excel.
Import	Initiates the import of the selected objects into the TEMS CellPlanner project.

Symbols in the "Import comparison" Window

The table below describes the symbols used with objects listed in the tree view:

Symbol	Description
	Right-pointing green arrow indicates that the object exists in OSS-RC but not in TEMS CellPlanner. The marked object will be added to the TEMS CellPlanner project.
	Left-.pointing red arrow indicates that the object exists in TEMS CellPlanner project but not in OSS-RC. The marked object will be deleted from the project.

Symbol	Description
	Yellow "Delta" symbol indicates that the object exists in both OSS-RC and the TEMS CellPlanner project, but there are differences between the two objects. The differing parameters are shown on the right. The marked object will be updated with parameter values from OSS-RC.
	Grayed out symbol and grayed out text indicates that the object has been deselected, and will not be imported.

Post-Checks After CNAI Import

After the CNAI import you need to do the following:

1. Perform a Project consistency check, see Check Project Consistency on page 3-22.
2. If some of the imported Sites or Antennas have undefined geographical position, height or azimuth, you must update them with the real geographical parameters, for example using the Import Generic Text File on page 18-38.

OSS-RC WCDMA Network Data

By importing WCDMA network data from OSS-RC you can optimize, tune or expand a real WCDMA network in TEMS CellPlanner.

The data exported from OSS-RC and imported into TEMS CellPlanner are in Bulk CM format, hence the import method is named *Bulk CM import*.

About Bulk CM Import

Bulk CM import allows you to populate a TEMS CellPlanner project with sites, equipment and cell data from a real WCDMA network managed by OSS-RC.

You can import the OSS-RC data into en empty project as well as update an existing project with configuration changes in the real network, for example new sites and cells installed or parameters changed.

Supported OSS-RC and RAN Versions

TEMS CellPlanner 9.0 supports import of Bulk CM files from OSS-RC versions R4, R5.2, R5.3, R6.1, R6.2, R6.3 and R7.1, and RAN versions P4 up to and including P7FP.

Information Available from the Bulk CM File

The following objects and parameters can be imported from OSS-RC to TEMS CellPlanner using Bulk CM files:

- Subnetwork, Location Areas, Routing Areas and Service Areas
- RNCs, RBSs, Sectors and Antenna Branches.
  Only the A branch of each Sector is imported, since antenna diversity is not modeled in TEMS CellPlanner.
- Antennas: Mechanical tilt and remote electrical tilt (RET)
- Feeder cables: UL and DL attenuation (total attenuation - not per meter)
- TMAs: DL attenuation and UL gain
- RNC cells: Cell ID, UARFCN DL and scrambling code.
  Power, admission and MBMS parameters, and Custom Attributes.
- RNC cells/RBS cells: HSDPA and EUL parameters.
- UTRAN-UTRAN neighbor cell relations
- UTRAN-GSM neighbor cell relations and External GSM Cells

Limitations of Bulk CM Files

Some information needed in TEMS CellPlanner projects is not available in OSS-RC and can thus not be imported from Bulk CM files. Use other import methods or define the information manually.

- Antenna Types
  The Bulk CM file only contains an integer index number (0, 1, 2, ...) for the antenna type of each sector antenna. Therefore, the mapping of index numbers to actual TEMS CellPlanner antenna types must be specified before starting the Bulk CM import (see Antenna type map in Fields on Window "Import OSS-RC WCDMA network data". Info on Antenna Type numbers can be found in the Ericsson CPI document "RETU Configuration Data" in the RBS Site Products library. If you do not have the precise information for each index number, it is also possible to specify a default Antenna Type.
  The Antenna type must have been imported to TEMS CellPlanner before starting the Bulk CM import.
- Fixed Electrical Tilt (FET) and Manual Electrical Tilt (MET) of antennas
  Only Remote Electrical Tilt (RET) is available in OSS-RC. If FET or MET antennas are used, there is no electrical tilt information in the Bulk CM file, hence the correct tilt angles must be set *after* the Bulk CM import.
- Feeder cable type (losses per meter) and feeder cable length
  In TEMS CellPlanner the UL/DL attenuation on a feeder cable is calculated as loss per meter (from Feeder cable type) * length of Feeder cable. In OSS-RC there is no information regarding the loss per meter or the length of the feeder cable, only the total attenuation is stored for each cable. Therefore, the Bulk CM import will use a default Feeder cable type and default length (25 m) for each imported feeder cable. If there is a WCDMA Feeder cable type defined in the project, that one will be selected as default. Otherwise, a dummy Feeder cable type will be created. The UL/DL attenuation of the Feeder cable will be incorporated into the *Override attenuation* of the Antenna branch. Since *Override attenuation* overrides the attenuation calculated from Feeder cable and TMA, the actual Feeder cable type will have no significance.
- TMA type
  Similar to Feeder cable types, OSS-RC contains DL attenuation/UL gain of TMAs, but not the type of each TMA. A default TMA type will be used for each imported TMA. The TMA attenuation/gain will be incorporated into the *Override attenuation* of the Antenna branch, so the TMA type will have no significance.

Geographical Parameters in Bulk CM File

Geographical information, like site/antenna position, height above ground, azimuth, etc. are optional in OSS-RC and often not set by operators. Therefore, these parameters may be missing from the Bulk CM file.

If you are importing new sites, whose geographical position are not defined in OSS-RC, then the latitude/longitude of these sites will be set to default value (0, 0). That is, in the map view, these sites will be located on the Equator and the Greenwich

meridian, which is not so useful for planning. Therefore, you need to update these sites with correct geographical parameters *after* the Bulk CM import.

As the geographical information is usually more accurate in TEMS CellPlanner than in OSS-RC, the geographical parameters are only imported for new Sites/Antennas. The position, height and azimuth of existing Sites/Antennas are never updated by Bulk CM import.

Importing ExternalGsmCells

ExternalGsmCells from OSS-RC are mapped to existing GsmCells in TEMS CellPlanner. The Cell Global Identity (CGI) is used to identify the GsmCell that corresponds to each ExternalGsmCell.

CGI = PLMN ID + LAC + Cell ID

where

PLMN ID = MCC + MNC + MNC length (from Plan)

LAC: from Location Area

Cell ID: from GsmCell

Note that the Bulk CM import does not create new GsmCells in the projects. ExternalGsmCells that cannot be mapped to existing GsmCells will not be imported. Thus neighbor relations pointing to such ExternalGsmCells will not be imported either.

Unsupported MOs

Import of ExternalUtranCells is not supported.

Process: How to Import WCDMA Cell Data from OSS-RC

Follow this process to import Bulk CM files exported from OSS-RC.

❶ Preparations Before Bulk CM Import

❷ Bulk CM Import, Part I: Read Bulk CM File

❸ Bulk CM Import, Part II: Compare, Select and Import

❹ Post-Checks After Bulk CM Import

Preparations Before Bulk CM Import

Before importing the Bulk CM file, you must do the following:

1. Acquire information about the antenna type numbers used in OSS-RC, and which antenna type corresponds to each OSS antenna type number used. See

the Ericsson CPI document "RETU Configuration Data" in the RBS Site Products library.

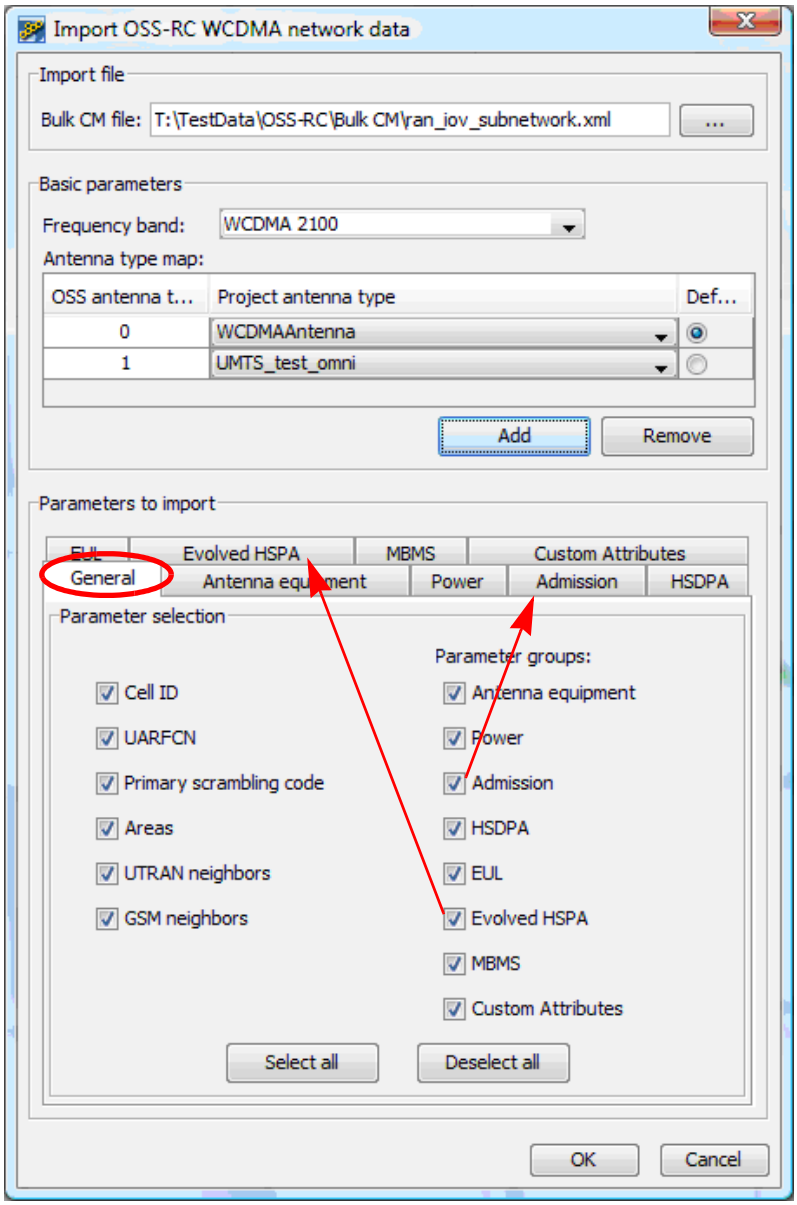
2. Load an existing TEMS CellPlanner project or create a new project.
3. Ensure that the relevant *WCDMA frequency band* is defined in the project. See Frequency Bands on page 5-7.
4. Ensure that the relevant *antenna types* are defined in the project before importing the Bulk CM file. You can import antenna types using Import EET/Planet 2.x Antennas. Make sure to import multiple antenna files for the same product number but different electrical tilt type as one antenna type, see parameters in About Antenna Types on page 5-35.
5. Optionally consolidate old Antenna Types:
   In old TEMS CellPlanner projects, an antenna product supporting multiple electrical tilt angles was represented as multiple antenna types with a single lobe each, one for each electrical tilt angle. In order to better support import/export of remote electrical tilt, it is recommended to merge these single lobe antenna types into one antenna type with multiple lobes. There is a script provided for this, named `antenna_type_util.py`. See Script Console on page 20-1 for information about the script location and how to run a script. Note that this script requires an argument: a list containing the names of the antenna types to be merged.
6. Optional: Define a relevant *Feeder cable type* and *TMA type* in the project.
7. Optionally import GSM neighbor relations, then you must first create or import the relevant *GSM cells,* see Importing ExternalGsmCells on page 18-27.
   For information on how to create and import GSM cells, see the *TEMS CellPlanner GSM User's Guide*.
8. Ensure project consistency, see Check Project Consistency on page 3-22.
9. Save the project.

Bulk CM Import, Part I: Read Bulk CM File

After Preparations Before Bulk CM Import, do as follows to read the Bulk CM file into TEMS CellPlanner:

1. Save the project.

2. Select **File↗Import↗OSS-RC WCDMA**. The **Import OSS-RC WCDMA network data** window with its **General** tab appears as in the example below:



See Fields on Window "Import OSS-RC WCDMA network data" for details about the window.

3. Select the Bulk CM file to import.
4. Select a WCDMA frequency band.
5. Click **Add** to add the antenna type numbers used in OSS-RC and associate them with the antenna types defined in TEMS CellPlanner.

6. Select an antenna type as **Default** antenna type.
7. From the General tab, select the parameters you wish to import, for example Cell ID, UARFCN, Scrambling code, and so on. Under **Parameter groups**, select the parameter groups to import. The corresponding tabs become enabled and all their parameters are by default selected.
8. Select or deselect individual parameters under each tab: **Antenna equipment**, **Power**, **Admission**, **HSDPA**, **EUL**, **MBMS** and **Custom Attributes**.
9. Click **OK**. TEMS CellPlanner reads the Bulk CM file. Only the selected parameters are read from the file.

   Note: *The Bulk CM data is not yet imported into the project.*

Proceed with Bulk CM Import, Part II: Compare, Select and Import.

Fields on Window “Import OSS-RC WCDMA network data”

Bulk CM file	Name of the Bulk CM file to import.
Basic parameters	
Frequency band	The WCDMA frequency band of the live network. Must be the correct Frequency band used in the network.
Antenna type map	Defines the mapping between OSS antenna type numbers and TEMS CellPlanner antenna types. • OSS antenna type - Unique number of an antenna type in OSS-RC. Only this number identifying the antenna type - not the antenna type definition as such - is exported from OSS-RC. See the Ericsson CPI document “RETU Configuration Data” in the RBS Site Products library. • Project antenna type - The antenna type defined in the TEMS CellPlanner project and corresponding to the OSS antenna type. • Default - OSS antenna type numbers other than the ones defined in the antenna type map are mapped to the antenna type marked as default.
Add	Adds a new OSS antenna type number
Remove	Removes an OSS antenna type number
Parameters to import	
All tabs	• Select all - Selects all selectable options in the tab window • Deselect all - Clears all options in the tab window

General tab

Parameter selection

General parameters to select or deselect for import:

- Cell ID
  Selects/deselects RNC cell parameter *cId*
- UARFCN
  Selects/deselects RNC cell parameters *uarFcnDl* and *uarFcnUl*
- Scrambling code
  Selects/deselects RNC cell parameter *primaryScramblingCode*
- Areas
  Selects/deselects RNC cell parameters *lac*, *sac* and *rac*. When deselected, *Location areas, Routing areas* and *Service areas* will not be imported either.
- UTRAN neighbors
- GSM neighbors, see Note

Note: *The **GSM neighbors** option is selectable only if you have a GSM license and have selected GSM in the Application Preferences.*

Parameter groups

Groups of parameters to enable or disable for selection

If a parameter group is selected, its corresponding window tab is enabled and all its parameters are automatically selected for import:

- Antenna equipment
- Power
- Admission
- HSDPA, see Note
- EUL, see Note
- Evolved HSPA
- MBMS
- Custom Attributes

Note: *The **HSDPA**, **EUL** and **Evolved HSPA** parameter groups are selectable only if you have an HSDPA license and have selected WCDMA, HSDPA in the Application Preferences.*

Antenna equipment tab

Antenna parameters to select or deselect for import:

- Mechanical downtilt
  Selects/deselects RBS Antenna parameter *mechanicalAntennaTilt*
- Electrical downtilt
  Selects/deselects RBS Antenna parameter *electricalAntennaTilt*
- Feeder cable attenuations, see Note
  Selects/deselects RBS Feeder cable parameters *ulAttenuation* and *dlAttenuation*
- TMA attenuation/gain, see Note
  Selects/deselects RBS TMA parameters *ulGain* and *dlAttenuation*

Note: *The feeder cable and TMA attenuation/gain values will be combined and imported into the "Override attenuation" values in the project. See* Limitations of Bulk CM Files *on page 18-26.*

Power tab Power parameters to select or deselect for import:

- Primary CPICH power
  Selects/deselects RNC cell parameter *primaryCpichPower*
- Primary SCH power
  Selects/deselects RNC cell parameter *primarySchPower*
- Secondary SCH power
  Selects/deselects RNC cell parameter *secondarySchPower*
- BCH power
  Selects/deselects RNC cell parameter *bchPower*
- PCH power
  Selects/deselects RNC cell parameter *pchPower*
- PICH power
  Selects/deselects RNC cell parameter *pichPower*
- AICH power
  Selects/deselects RNC cell parameter *aichPower*
- Max FACH1 power
  Selects/deselects RNC cell parameter *maxFach1Power*
- Max FACH2 power
  Selects/deselects RNC cell parameter *maxFach2Power*
- Max Tx power DL
  Selects/deselects RNC cell parameter *maximumTransmissionPower*

Admission tab Admission control parameters to select or deselect for import:

- Power admission DL
  Selects/deselects RNC cell parameter *pwrAdm*
- No. of orthogonal codes
  Selects/deselects RNC cell parameter *dlCodeAdm*
- Capacity limit (ASE) DL and UL
  Selects/deselects RNC cell parameters *aseUlAdm* and *aseDlAdm*
- BE limit, SF8 (conn) DL
  Selects/deselects RNC cell parameter *sf8Adm*
- BE limit, SF16 (conn) DL
  Selects/deselects RNC cell parameter *sf16Adm*
- BE limit, SF32 (conn) DL
  Selects/deselects RNC cell parameter *sf32Adm*
- Cell range
  Selects/deselects RNC cell parameter *cellRange*

HSDPA tab HSDPA parameters to select or deselect for import:

- Number of HS-SCCH codes
  Selects/deselects RNC cell parameter *numHsScchCodes*
- HS-DSCH power margin
  Selects/deselects RBS cell parameter *hsPowerMargin*
- HS-SCCH max code power
  Selects/deselects RBS cell parameter *hsScchMaxCodePower*
- Dynamic Code Allocation
  Selects/deselects RBS cell parameter *dynamicHsPdschCodeAdditionOn* or *featureStateHsdpaDynamicCodeAllocation*
- Max number of HSDPA users
  Selects/deselects RBS cell parameter *maxNumHsdpaUsers*
- Flexible scheduler
  Selects/deselects RBS parameter *flexibleSchedulerOn* or *featureStateHsdpaFlexibleScheduler*
- Max no. of SF=4 users on UL
  Selects/deselects RNC cell parameter *sf4AdmUl*

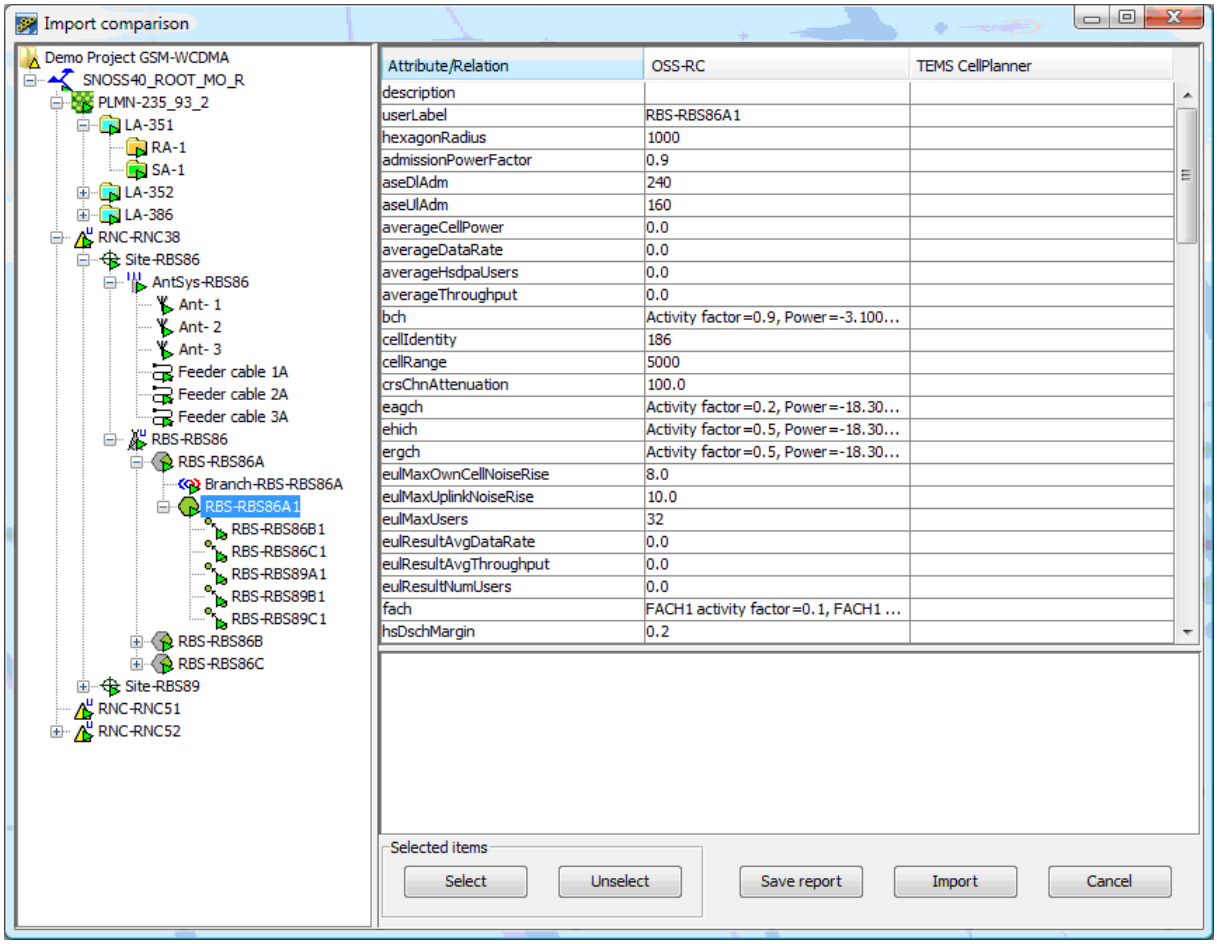
EUL tab	EUL parameters to select or deselect for import: • EUL max UL noise rise Selects/deselects RBS cell parameter *eulMaxRotCoverage* • Max E-AGCH power DL Selects/deselects RBS cell parameter *maxEAgchPowerDl* • Max user E-HICH/E-RGCH power DL Selects/deselects RBS cell parameter *maxUserEHichERgchPowerDl* • EUL max own cell noise rise Selects/deselects RBS cell parameter *eulMaxOwnUuLoad* • Max number of EUL/HSPA users Selects/deselects RNC cell parameter *eulServingCellUsersAdm* • 2 ms TTI Selects/deselects RBS cell parameter *featureStateEul2msTTI*
Evolved HSPA tab	Evolved HSPA parameters to select or deselect for import: • Number of Tx antennas Selects/deselects RBS cell parameter *numberOfTxBranches* • Modulation Selects/deselects RBS parameter *supportOf16Qam*, *featureState16Qam* or *featureState64Qam* • Transmission scheme Selects/deselects RNC cell parameter *transmissionScheme* and RBS cell parameter *featureStateMimo*
MBMS tab	MBMS parameters to select or deselect for import: • MTCH 64 relative power Selects/deselects RNC cell parameter *mtch64PowerOffset* • MTCH 128 relative power Selects/deselects RNC cell parameter *mtch128PowerOffset* • MTCH 256 relative power Selects/deselects RNC cell parameter *mtch256PowerOffset* • MCCH relative power Selects/deselects RNC cell parameter *mcchPowerOffset* • MICH relative power Selects/deselects RNC cell parameter *michPowerOffset*
Custom Attributes tab	Customized parameters to select or deselect for import: • Individual offset Selects/deselects RNC cell parameter *individualOffset* • Min quality level Selects/deselects RNC cell parameter *qQualMin* • Min Rx level Selects/deselects RNC cell parameter *qRxLevMin* • Max Tx power UL Selects/deselects RNC cell parameter *maxTxPowerUl* • Min power per RL Selects/deselects RNC cell parameter *minPwerRl*

Bulk CM Import, Part II: Compare, Select and Import

After the Bulk CM file is read into TEMS CellPlanner, do as follows to select the objects to import and perform the actual import:

10. When the file reading completes, the **Import comparison** window appears, showing the differences between the Bulk CM file and the current TEMS CellPlanner project, as in the example below.

    Note: *Only the parameters selected for import are compared and displayed.*



    See Fields on the "Import comparison" Window on page 18-36 for a detailed description of the window.

11. By default, all objects in the tree are selected for import. If you wish to exclude any objects from the import, highlight them and click **Unselect**. All objects in the sub-tree below the deselected object are automatically deselected. The deselected objects are grayed out.

    To make a deselected object selected again, highlight it and click **Select**. All objects in the sub-tree below the selected object are automatically selected.

12. Click **Import**. The selected objects with parameters are imported into the project.

Proceed with Post-Checks After Bulk CM Import.

Fields on the "Import comparison" Window

Tree-view on the left side of the window	Displays the objects that are about to be created or modified in the TEMS CellPlanner project. The tree hierarchy reflects the network structure used in OSS-RC, similar to the one used in the TEMS CellPlanner Network explorer. All objects in the tree-view are initially selected for import. The symbols on each object in the tree-view indicates the object status, see Symbols in the "Import comparison" Window on page 18-36.
Upper right side of the window	Displays parameter names (Attribute/Relation) and values for the objects highlighted in the tree-view. The values in the Bulk CM file (OSS-RC) as well as in the project (TEMS CellPlanner) are displayed. ***Note:*** *Only the parameters selected for import are compared, and only those with different value in the Bulk CM file compared to the project are displayed.* ***Note:*** *The parameter names used in this window are the names from the TEMS CellPlanner Information Model, not from OSS-RC.*
Select	Selects the highlighted object and its sub-objects in the tree-view.
Unselect	Deselects the highlighted object and its sub-objects in the tree-view. The objects will be grayed out.
Import	Initiates the import of the selected objects into the TEMS CellPlanner project.

Symbols in the "Import comparison" Window

The table below describes the symbols used with objects listed in the tree view:

Symbol	Description
	Right-pointing green arrow indicates that the object exists in OSS-RC but not in TEMS CellPlanner. This object will be added to the TEMS CellPlanner project.
	Left-.pointing red arrow indicates that the object exists in TEMS CellPlanner project but not in OSS-RC. This object will be deleted from the project.

Symbol	Description
	Yellow "Delta" symbol indicates that the object exists in both OSS-RC and TEMS CellPlanner project, but there are differences between the two objects. The differing parameters are shown on the right. The TEMS CellPlanner object will be updated with parameter values from OSS-RC.
	Grayed out symbol and grayed out text indicates that the object has been deselected, and will not be imported.

Post-Checks After Bulk CM Import

After the Bulk CM import you might need to do some of the following:

1. Perform a Project consistency check, see Check Project Consistency on page 3-22.
2. If you have imported new Sites or Antennas with undefined geographical position, height or azimuth, you must update these objects with the real geographical parameters, for example using the Import Generic Text File. See Geographical Parameters in Bulk CM File on page 18-26.
3. If you have imported new Sites or Sectors, you must assign a Propagation model to the Antenna branches, to be able to perform predictions.

Text Files

Post/pre-processing data in text files is sometimes required for advanced search and replace in a spreadsheet application or text editor.

You export objects and attributes from TEMS CellPlanner to a text file, edit the file in the external application, and import it back into TEMS CellPlanner.

TEMS CellPlanner provides text file import functions - with corresponding export functions - for the following information:

- generic information, see Import Generic Text File
- cell and radio repeater attributes, see Import Attribute Text File
- neighbors, see Import Cell Neighbors Text File
- GSM carriers, see Import GSM Carriers Text File
- attributes, see Import Attribute Text File

Import Generic Text File

Quick Introduction to Generic Text Files

Importing and exporting generic text files of Generic Text File Format is flexible. The files are called generic as TEMS CellPlanner does not recognize cells, sites, antennas, and so forth, but *objects*, *attributes* and *relations*. You can import any object and parameter described in the TEMS CellPlanner information model.

The generic text file format is required for importing and exporting data to use with a third party application not supporting any dedicated text format. As an example, you must use generic text files to export/import flags or feeder cable types.

...and Non-Generic Text Files

Generic text file import/export is intended to be used when no dedicated import/export function is provided for the objects you want to import/export.

Before deciding to import or export generic text files, first check if another import or export option is more appropriate. If you can, use those functions instead.

The following dedicated import functions - with corresponding export functions - are provided in TEMS CellPlanner:

- Import Generic Text File - each row in the file represents a specific cell
- Import GSM Carriers Text File
- Import Cell Neighbors Text File
- Import EET/Planet 2.x Antennas

Examples of Generic Text File Import

Study the provided examples with recommended import option settings:

- Generic Text File Example: Batch Edit
- Generic Text File Example: Modify Antenna Type Attributes
- Generic Text File Example: Modify GSM Cell Attributes
- Generic Text File Example: Import Flags
- Generic Text File Example: Export/Import Feeder Cable Types

For clarity, initial line(s) with coordinate system info are left out from the examples.

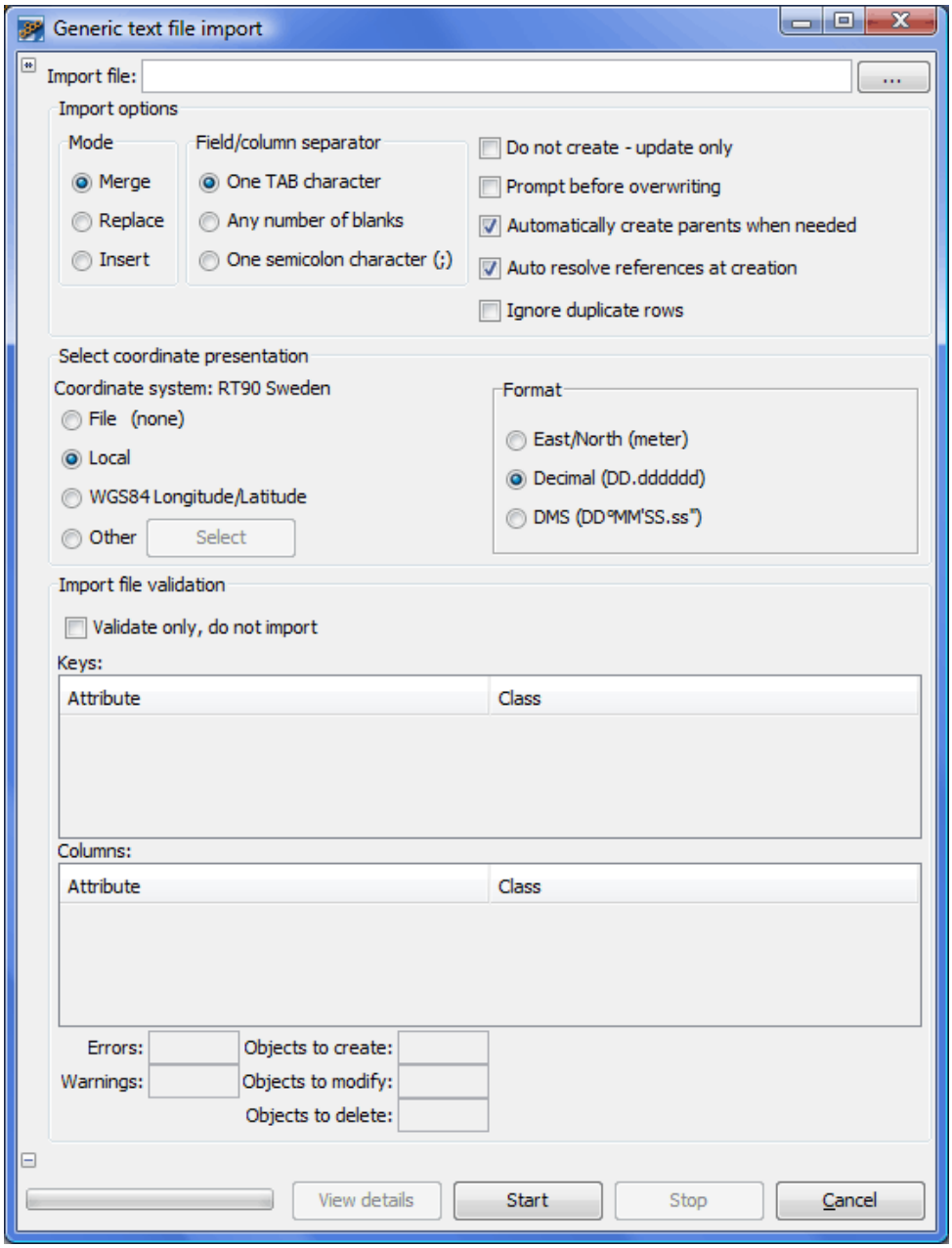
Preparations

Read section Details on Generic Text File Import/Export or look it up when needed.

Procedure

Do as follows to import a generic text file:

1. Select **File↗Import↗Generic text file.** The **Generic text file import** window appears as in the following example:

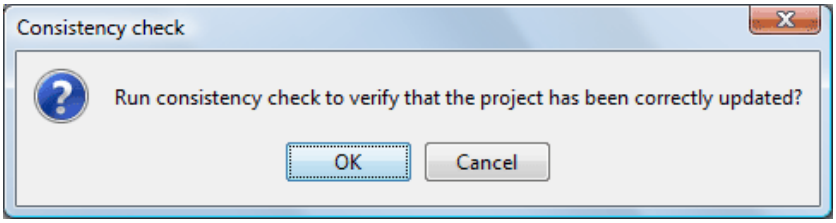


See Fields on Window "Generic Text File" on page 18-45.

2. Enter or browse the name of the import file.
3. To validate the import file without updating the project with imported data, select **Validate only, do not import**.

4. Click **Start** to initiate the import (or just validation). If just validating, the procedure ends here.
5. You are prompted to run a consistency check.

   Note: *It is strongly recommended to check the consistency. Inconsistent import data might destroy your loaded project.*



6. Click **OK** to Check Project Consistency.
7. Click **View details** to ensure the import was successful.
8. After importing:
   - Verify there are no errors during the import by clicking **View details**.
   - Verify that sites are visible in the display after import. If not click **AutoRange** under **Map↗Display properties↗Map properties↗Overall**.

Details on Generic Text File Import/Export

To successfully import or export objects with complex relations, or objects down in a hierarchy, you need to understand the *information model* of TEMS CellPlanner.

How to View the Information Model

Select **Start↗Programs↗Ascom↗TEMS Products↗TEMS CellPlanner/ x.y.z↗Manuals↗Information model** to view and print a copy of the TEMS CellPlanner information model document. You might need to look up this document when importing more complex generic text files.

What is the Information Model?

The information model includes all objects with attributes that you can configure in any explorer. An information model object can have attributes, relations, and aggregates:

Attribute	Example: *ncc*.
Relation	A reference to an object shared by multiple objects. Example: *frequencyBand*.
Aggregate	A child object; cannot exist without a parent Example: A GSM cell requires a GSM RBS as parent.

Mandatory Relations and Aggregates

Relations as well as aggregates can be mandatory. Examples:

- Mandatory relation: A *GsmCellTemplate* requires a relation to a *frequencyBand*
- Mandatory aggregate: An AntennaType requires at least one *AntennaBand* as a child

Complex Export/Import and Dependencies

Exporting and importing GSM RBS templates (*BtsTemplate*) is complicated, so we provide general guidelines and insight about how to handle dependencies between different objects in a TEMS CellPlanner project.

A *BtsTemplate* must have a relation to an antenna template and it may have up to eight *GsmCellTemplate* children.

You must export in two steps, first *BtsTemplate* objects to one file, and then *GsmCellTemplate* objects to another file. The order for exporting does not matter.

Relations to other objects are exported as strings in the export file containing the name (userLabel) of the object in the other end of the relation.

If you import the file containing *BtsTemplate* objects into an empty project, Generic text import tries to resolve the antenna system reference, looking for an antenna template object with the same name as the one in the import file. If it does not find any you are prompted to select/create one. Repeat this for each GSM RBS template. First import antenna template objects before importing *BtsTemplate* objects.

If you look at antenna template, you see that they have a name, and a several relations to antenna template objects. This implies you must export antenna templates to one file and antenna template to another file.

The antenna template objects have a mandatory relation to antenna type. Before you import antenna template objects, make sure that you already have all antenna types referred to by the antenna template objects to import. You are prompted for each one.

To perform the export, export antenna template objects, using *AntennaTemplate.userLabel* as key, and all attributes and relations after that. Export all antenna template to another file, using *AntennaSystemTemplate.userLabel* as the key and all relations you want to export.

Then export all GSM RBS templates to another file. Select *BtsTemplate.userLabel* as key and include the *antennaSystem* in the export, since it is a mandatory relation.

After that, export *GsmRbsTemplate* objects, selecting both the *userLabel* and the cell template as key and *userLabel* of its parent (*BtsTemplate*) as key, creating a composite key. A composite key is needed because the *userLabel* of the GSM cell template object may not be unique in the whole project. The same name can also be used in another GSM RBS template. Include the mandatory relation *channelGroups* in the export.

A GSM cell template has a mandatory relation to the channel group template, so you must export these separately. Include the relation *frequencyBand* in the *GsmCellTemplate* export because this relation is mandatory.

GSM cell templates have antenna branch templates as children. If you want the information from the antenna branch templates, you must export these separately. You will have a key composed of three parts (*BtsTemplate.userlabel/ GsmCellTemplate.userLabel/AntennaBranchTemplate.userLabel*).

When you begin the import, you have several files containing -related information. Perform the import in order of dependency, in the opposite order of the export.

1. Ensure that you have all required frequency bands, antenna types, channel group templates, and propagation models in the project you import into.
2. Import antenna template objects. The associated antenna types must exist in the project.
3. Import antenna template objects.The associated antenna template objects must exist in the project.
4. Import GSM RBS template objects, GSM cell template objects and antenna branch template objects. The order does not matter because the aggregations are not mandatory.

Generic Text File Format

Generic text files are tab or space delimited ASCII files of rows. Each row contains the same number of columns, like the files exported from Microsoft Excel. The first row in the file specifies the contents of the data in all columns.

- Definition: Object Key

  The key is the left-most column that identifies an object. A key can be an attribute or relation of the object, and optionally also contain any of its parents.

- Careful selection of keys

  Select key(s) carefully when arranging the export; the key(s) must uniquely identify one row in the export file and an object of that type in your project.

  Sometimes you must combine several attributes to produce a unique left-most column (for example, *Bts.userLabel* and *GsmCell.userLabel* if you use a convention that gives cells a non-unique name, like "A", "B", "C").

- Each class must have a corresponding attribute

  Verify that each class listed as a key has a corresponding attribute. The import/ export might otherwise not be properly done, and you might need to include the attribute in the export object before an import can be done.

- Import file validation

  A valid import file must match the following criteria:

  - The first row must contain column specifications

- Subsequent rows must contain the same number of columns
- All numeric parameters in all columns must conform to format and range
- The key in the first column may only match one object type in the project
- The key in the first column must be unique within the file itself

- Empty numeric attributes

  TEMS CellPlanner substitutes empty numeric attributes from a text file with default attribute values and displays a warning about the substitution.

Fields on Window "Generic Text File"

Import file	Name and directory path of file to import
Mode	• Merge - Merges imported parameters into existing objects • Replace - Replaces existing objects with imported objects • Insert - Imports only new objects and does not replace or merge existing objects
Field/column separator	• Any number of blanks - Any number of spaces and tab characters separate two columns. You may not have empty columns. • One TAB character - Exactly one tab character separates two columns. Use this for import from Excel tab-separated files (.txt). You may have empty columns. • One semicolon character (;) - Exactly one semicolon character separates two columns. Use this for import from Excel .skv files. You may not use semicolons in the data.
Do not create - update only	Imports only existing objects. Does not import new objects. Disabled when *Insert* mode is active. This option is useful when an import file contains objects not in your project. You can prevent those new objects from being created.
Prompt before overwriting	Displays a window for every object written or created. Disabled when Insert mode is active.
Automatically create parents when needed	Automatically creates parent objects of objects being created during import.
Auto resolve references at creation	Disabled when Update is selected
Ignore duplicate rows	Used when an import file contains more than one row with the same key.
Coordinate system	Display-only field shows the selected coordinate system, whether from import file, current project, WGS84, or another selected coordinate system.
File	Uses the coordinate system from the cells text file.
Local	Retains the coordinate system from the project settings after import.
WGS84 Longitude/ Latitude	Uses the WGS84 longitude/latitude.
Other	Uses another map reference system that you can select from a list.

Format	Format of map coordinate system: • East/North (meter) • Decimal (DD.ddddd) • DMS (DD°MM'SS.ss")
Validate only, do not import	Validates the data in the import file, and does not import any information into the project.
Keys	• Attribute • Class
Columns	• Attribute • Class
Errors	Number of errors found during validation.
Warnings	Number of warnings generated during validation.
Objects to create	Number of objects to create during validation.
Objects to modify	Number of objects to modify during validation.
Objects to delete	Number of objects to delete during validation.

Generic Text File Example: Batch Edit

You can use Generic text file export and import to modify attribute values of existing objects outside TEMS CellPlanner.

1. Export the key (first column) and the attribute(s) to modify
2. Edit the file in some text or spreadsheet application.

   Note: *Do not modify the key (first) column. The key is used to identify the object to modify. If you edit the import file's key column before importing it, new objects might be created but existing ones remain untouched, and this is probably not be what you expect to happen.*

3. Import the text file with the following options enabled:
   - **Merge**
   - **TAB**
   - **Automatically create parents when needed**
   - **Auto resolve references at creation**
   - Optional: Select **Do not create - update only**

Generic Text File Example: Modify Antenna Type Attributes

In this example the goal is to export, modify and import the *productNumber* attribute in all Antenna types using the **Generic text file** option.

1. Start Generic text file export.
2. Select the attribute productNumber below Antenna types.

   If you export at this point, an export file would be created containing only one column: productNumber, exactly as commanded. In this case you would

probably get a message that the key 'productNumber' is not unique. The file would be impossible to import because no information would exist about which Antenna type object each productNumber attribute belongs to.

3. Select a key (userLabel usually works fine for this because it uniquely distinguish between different Antenna type objects). Select *userLabel* and make sure it is first in the list on the right hand side, as the top/first attribute becomes the attribute used as key.

4. Perform the export. The resulting export file will now look something like:

```
AntennaType.userLabel          productNumber
KRE1011935                     1
739494                         1
```

5. Edit the productNumber in the text file, for example:

```
AntennaType.userLabel          productNumber
KRE1011935                     10
739494                         11
```

6. Set import options (see Table 18-1) and validate the import file (select **Validate only** and click **Start**). Make sure no errors are detected.

7. Deselect **Validate only** and perform the full import.

Table 18-1 Import options for import of antenna type attributes from text file

Import option	Recommended settings
Mode	Select **Merge** when you want each imported row to be merged with the existing Antenna type object. Set productNumber for each object but do not alter other attributes and relations. If you select **Replace**, all attributes for each antenna type object you do not refer to in the import file are assigned initial values for attributes before the productNumber attribute is set. If you select **Insert**, nothing happens when you import, because Insert means that import creates Antenna type objects only not the project, and does not modify existing Antenna types. In the example, all Antenna type objects already exist, unless you modified Antenna types manually added new rows in the exported file after the export.

Import option	Recommended settings
Field/column separator	Select **One TAB character**, the preferred format because spreadsheet applications like Excel can read it. You can have empty columns and semicolons in the data.
Other options	Select **Do not create - update only** as a safe option. Do not select **Prompt before overwriting**, unless you want to see a window for every object written or created. The options **Automatically create parents when needed** and **Auto resolve references at creation** do not affect the example because they control the behavior in creating objects, and you want only to update existing objects. Use the option **Ignore duplicate rows** when you have an import file that contains more than one row with the same key.

Generic Text File Example: Modify GSM Cell Attributes

This example is similar to the Generic Text File Example: Modify Antenna Type Attributes. The difference is that you use a *composite key* with an attribute of the object (GSM cell) and its parent (RBS). Composite keys must be used when a combination of attributes are required to build up a unique identifier, in this case the name of the cell, and the name of the RBS.

In this example the goal is to export, modify and import the *hexagonRadius* attribute in GSM cells.

1. Start Generic text file export.
2. Select the attribute hexagonRadius in GSM cell.
3. Select userLabel in GSM cell and userLabel in the parent RBS.
4. Make userLabel the key for the GSM cell by making it the first attribute on cell, that is, above hexagonRadius.
5. Perform the export.

   The resulting export file will now look something like:

```
Bts.userLabel/GsmCell.userLabel  hexagonRadius
R00001/R00001A                   1000
R00001/R00001B                   1000
R00001/R00001C                   1000
R00002/R00002A                   1000
...
```

6. Edit the text file, for example:

```
Bts.userLabel/GsmCell.userLabel  hexagonRadius
R00001/R00001A                   1200
R00001/R00001B                   1200
```

```
R00001/R00001C                  1200
R00002/R00002A                  1200
...
```

7. Set import options see Table 18-2)) and validate the import file (select **Validate only** and click **Start**). Make sure no errors are detected.
8. Deselect **Validate only** and perform the full import.

Generic Text File Example: Import Flags

Importing flags involves creating objects but is easier because of the simplicity of the flag objects. You need to include an attribute, in this case *description*.

Example of import file with flags:

```
Flag.userLabel          description
FG2/A                   -
FG1/A                   -
FG1/B                   -
```

Table 18-2 Import options for import of flags from text file

Import option	Recommended settings
Mode	Not applicable
Field/column separator	Select **One TAB character** unless you have a good reason not to.
Other options	Do not select **Do not create - update only** because you want the import to be able to create new objects. Option **Prompt before overwriting** does not apply to this example because we want to create new objects. You must select the option **Automatically create parents when needed** because the file contains *flag objects*. The option **Auto resolve references at creation** does not apply to this example because the flag objects (or any other automatically created objects) do not have references to other objects that must be resolved during import (like relations to frequency bands, propagation models, and so forth). The option **Ignore duplicate rows** does not apply to this example because the file will not contain rows with duplicate keys.

Generic Text File Example: Export/Import Feeder Cable Types

This example describes exporting and importing feeder cable types with Generic text file export and import. This is a slightly more complicated example because it involves creating objects in two steps:

1. Export *feeder cable type* objects to a file. The result might look as in the following example:

FeederCableType.userLabel/ FeederCableTypeLoss.frequencyBand	dlFrequency	dlLossPer Meter	ulFrequency	ulLossPer Meter
FCT1/GSM 900	9.0E8,9.01E8	1.0,2.0	9.0E8,9.01E8	1.0,2.0
FCT1/WCDMA 2100	2.1E9,2.10099994E9	5.0,6.0	2.1E9,2.10099994E9	4.0,5.0
FCT2/WCDMA 2100	2.15000013E9,2.15100006E9	10.0,9.0	2.10099994E9,2.102E9	1.0,2.0

   Note that the feeder cable type loss lacks the *userLabel* attribute to use as the key. If you look in the **Equipment explorer**, the frequency band distinguishes different feeder cable type loss objects within a feeder cable type, so frequencyBand is an appropriate key.

2. Export *feeder cable type loss* objects to another file, and create additional objects of the same type. The result might look as in the following example:

FeederCableType.userLabel	description	enable	model	productNumber	productRevision	vendor
FCT1	Text	1	M1	P123	1.0	
FCT2		1	M2	P321	1.0	

3. Post-process the files as desired, for example to create additional *feeder cable type loss* objects in the appropriate file.
4. Import the processed files back into your project:
   - Start Generic text file import.
   - Set the import options (see Table 18-3).
   - Validate that the file containing feeder cable type losses contains no errors
   - Import the file containing feeder cable type losses

   Note: *After this import we have the feeder cable type objects with fully initialized feeder cable type loss objects, but the attributes besides userLabel for the feeder cable type objects are not initialized.*

   - Validate the file with *feeder cable type* attributes, ensure no errors found
   - Set the import options (see table below).
   - Import the file with *feeder cable type* attributes

Table 18-3 *Import options for import of feeder cable types from text file*

Import option	Recommended settings
Mode	If feeder cable types do not exist in the project, this option does not apply.

Import option	Recommended settings
Field/column separator	Select **One TAB character**, assuming that the input file is TAB-separated.
Other options	Do not select **Do not create - update only** because you want the import to create new objects. **Prompt before overwriting** does not apply because we want only to create new objects. Select option **Automatically create parents when needed** because the file to import contains *feeder cable type loss* objects. These objects are children of *feeder cable type* objects, and cannot exist without the parent object. This option creates *feeder cable type* objects while importing *feeder cable type loss* objects. The option **Auto resolve references at creation** does not apply, because it resolves mandatory references not contained in the import file. The *feeder cable type loss* object has a mandatory reference named *frequencyBand*, but the value for it is clearly specified in the import file. The option **Ignore duplicate rows** is not used because the file does not contain rows with duplicate keys.

Import Cells Text File

Use this procedure to import cell data for GSM, WCDMA or LTE from a tab-separated text file where each row describes a cell, or a radio repeater, according to Cells Text File Format on page 19-29.

Attributes of network elements like sites, RBSs, sectors, cells, antenna branches, antennas, radio repeaters, ASCs, TMAs, feeder cables, frequency bands, and propagation models, can be imported.

The cells text import has the following limitations:

- *Technology separation*
  You can only import cell data of one radio technology at a time.
  Cell data of different technologies must be imported from different files.
- *Compatibility*
  Exported cell data is only granted to be importable into a TEMS CellPlanner Client of the same version as the one used for export.
  To export/import data between different TEMS CellPlanner versions, use instead Project XML Files.

Prerequisites

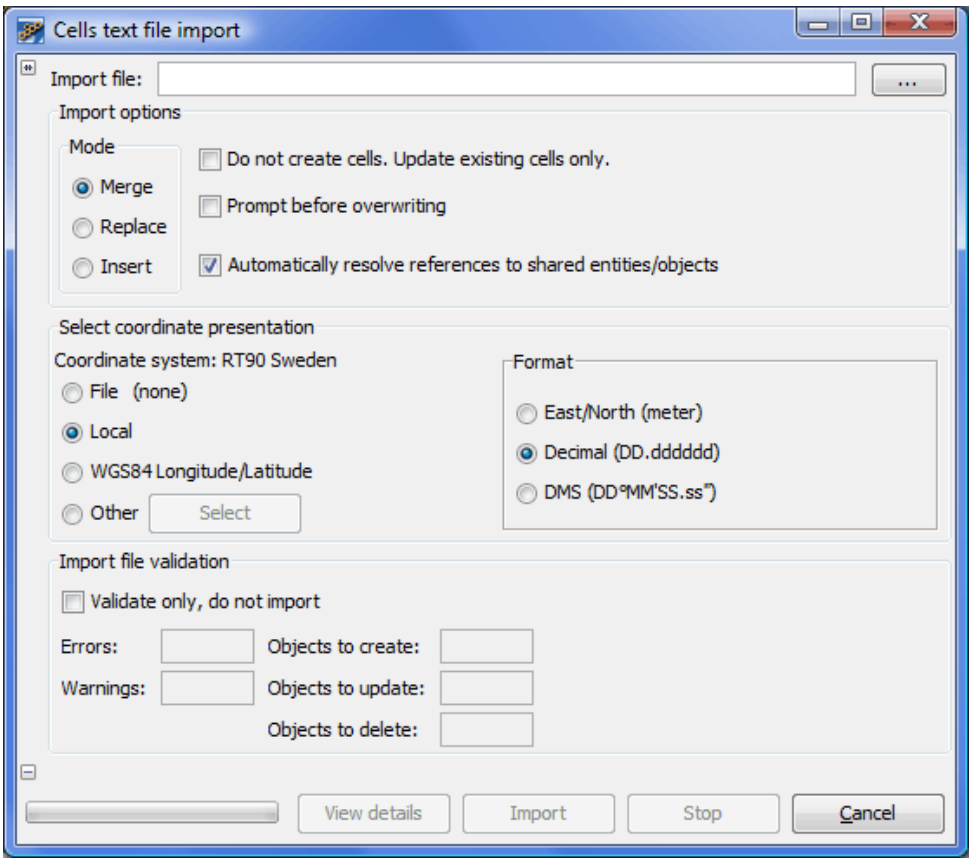
The import file must meet the following requirements:

- The file is organized according to the Cells Text File Format. See Example of Cells Text Import File.
- A cell can be imported only if its site, RBS, frequency band, is included in the import file. In the case of WCDMA or LTE, the sector must also be included.
- Antenna branches must be associated with a propagation model and an antenna.
- Sites must have valid positions.
- The same coordinate reference system must be used in the importing project and in the import file. See Select Coordinate System for Project on page 3-9 and header description in Cells Text File Format on page 19-29.

Procedure

Follow these steps to import cell text data:

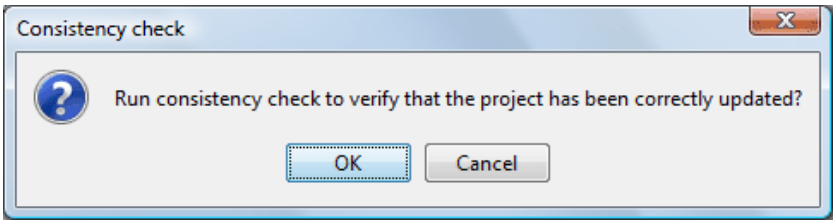
1. Select **File↗Import↗Cells text file.** The **Cells text file import** window appears as in the example below:



2. Select the file to import.

3. Select import options, see Fields on Window "Cells text file import".
4. Select the same coordinate system as in the importing project and the import file.
5. To validate the import file without updating the project with imported data, select **Validate only, do not import**.
6. Click **Import** to start the import (or just validation). If just validating, the procedure ends here.
7. If any attribute is missing in the import file, a default value is used instead and a warning regarding the substitution is displayed.
8. You are prompted to run a consistency check.

   Note: *It is strongly recommended to check the consistency. Inconsistent import data might destroy your loaded project.*



9. Click **OK** to Check Project Consistency.

Fields on Window "Cells text file import"

Import file	Import file following the Cells Text File Format.
Import options:	
Mode	Operating mode for the cell text import. "Objects" in the list below are either cell or radio repeater objects. • Merge - Creates new objects. Existing object attributes will be updated by data from the import file. Attributes that do not exist in the import file will be left untouched. • Replace - Creates new objects. Existing cells are replaced completely with information from the import file • Insert - Imports only objects that do not exist in the project
Do not create cells, update existing cells only	Does not create new cells in the project, updates cells only already existing in the project.
Prompt before overwriting	Displays a message allowing you to accept or reject the suggested changes.
Automatically resolve references to shared entities/objects	Creates objects/entities when required, for example shared frequency bands and RBS types.
Coordinate system selection:	

Coordinate system	Display-only field indicates the selected coordinate system in the import file. You can select another coordinate system from these options: • **File** - coordinate system from the import file. Uses the coordinate system from the cells text file after import. If the file to import has a coordinate system, this option is recommended. • **Local** - coordinate system in the current project. Retains the coordinate system from the current project settings after import. • **WGS84 Longitude/Latitude** - Uses the WGS84 longitude/latitude coordinate system after import. • **Other** - Uses another map reference system after import, selected from a list of available systems. If you select an incorrect coordinate system, the coordinates will be wrong and the equipment moved or placed at wrong positions in the project.
Format	Format of map coordinate system coordinates: • East/North (meter) • Decimal (DD.ddddd) • DMS (DD°MM'SS.ss")
Import file validation:	
Validate only, do not import	Validates the data in the import file, and does not import any information into the project.
Errors	Number of errors found during the validation process.
Warnings	Number of warnings generated during the validation process.
Objects to create	Number of objects (cells or radio repeaters) to create in the project found during the validation process.
Objects to update	Number of objects (cells or radio repeaters) to update in the project found during the validation process.
Objects to delete	Number of objects (cells or radio repeaters) to delete from the project found during the validation process.
Import	Starts the cell text file import. Validation of the data in the import file is automatically performed during the import.
View details	Displays errors and warnings from the import process.

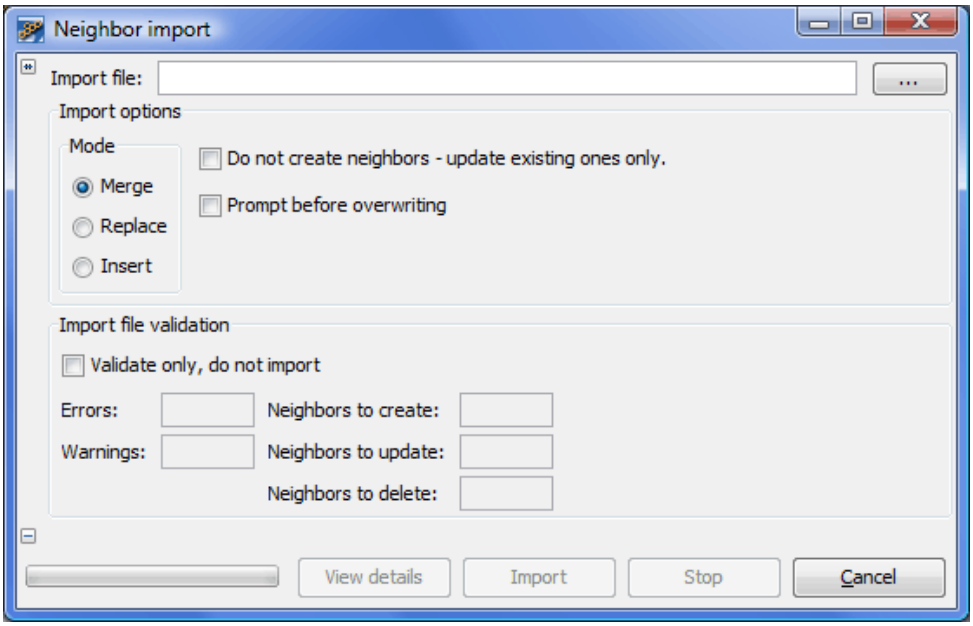
Example of Cells Text Import File

GsmCell.userLabel	cell Identity	GsmCell.predictionModel	GsmCell.frequencyBand	Site.userLabel	position
R00001A	0	9999-GSM 900	GSM 900	Site-00001	18.048025/59.336228
R00001B	0	9999-GSM 900	GSM 900	Site-00001	18.048025/59.336228
R00001C	0	9999-GSM 900	GSM 900	Site-00001	18.048025/59.336228
R00002A	1	9999-GSM 900	GSM 900	Site-00002	18.045588/59.314700
R00002B	2	9999-GSM 900	GSM 900	Site-00002	18.045588/59.314700
R00002C	10	9999-GSM 900	GSM 900	Site-00002	18.045588/59.314700
R00003A	0	9999-GSM 900	GSM 900	Site-00003	18.085731/59.335224
R00003B	0	9999-GSM 900	GSM 900	Site-00003	18.085731/59.335224
R00003C	0	9999-GSM 900	GSM 900	Site-00003	18.085731/59.335224
R00004A	0	9999-GSM 900	GSM 900	Site-00004	18.085270/59.313132
R00004B	0	9999-GSM 900	GSM 900	Site-00004	18.085270/59.313132
R00004C	0	9999-GSM 900	GSM 900	Site-00004	18.085270/59.313132

Import Cell Neighbors Text File

Do as follows to import cell neighbors text files of format described in Cell Neighbors Text File Format on page 18-56.

1. Select **File↗Import↗Cell neighbors text file.** The **Neighbor import** window appears as in the example below:

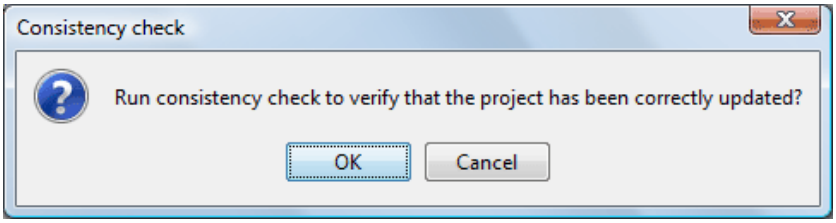


   See Fields on Window "Neighbor import" on page 18-56.

2. Select import options, and the coordinate system to use for the imported data.
3. To validate the import file without updating the project with imported data, select **Validate only, do not import**.

4. Click **Import** to start the import (or just validation). If just validating, the procedure ends here.
5. You are prompted to run a consistency check.

   Note: *It is strongly recommended to check the consistency. Inconsistent import data might destroy your loaded project.*



6. Click **OK** to Check Project Consistency.

Cell Neighbors Text File Format

One row per cell neighbor object. Any attribute defined for these objects may appear in the input file.

When TEMS CellPlanner finds empty attributes in a text file, it substitutes an initial value for the attributes, and displays a warning regarding the substitution.

Fields on Window "Neighbor import"

Import file	Name of cell neighbors text file to import
Import options:	
Mode	• Merge • Replace • Insert
Do not create neighbors - update existing ones only	Indicates that neighbor relationships should not be created but updated only
Prompt before overwriting	Indicates that the system should prompt you before overwriting existing data.
Import file validation:	
Validate only, do not import	Validates the data in the import file, and does not import any information into the project.
Errors	Number of errors found during import/validation
Warnings	Number of warnings occurring during import/ validating
Neighbors to create	Number of neighbor relations to create
Neighbors to update	Number of neighbor relations to update
Neighbors to delete	Number of neighbor relations to delete

Example of a Cell Neighbors Text File

The following example shows an export file of GSM cell neighbors:

```
Type    Neighbor
Version 1
Technology     GSM
Date    Oct 20, 1953 4:27:10 PM
Comment
GsmCell.userLabel/GsmRelation.userLabel    description  gsmRelationId qOffset1sn
adjacentCell   externalGsmCell
R00001A/R00001B        R00001B 0       R00001B
R00001A/R00001C        R00001C 0       R00001C
R00001B/R00001A        R00001A 0       R00001A
R00001B/R00001C        R00001C 0       R00001C
R00001C/R00001A        R00001A 0       R00001A
R00001C/R00001B        R00001B 0       R00001B
R00002A/R00002B        R00002B 0       R00002B
R00002A/R00002C        R00002C 0       R00002C
R00002B/R00002A        R00002A 0       R00002A
R00002B/R00002C        R00002C 0       R00002C
R00002C/R00002A        R00002A 0       R00002A
R00002C/R00002B        R00002B 0       R00002B
```

Import Neighbors to Generated Neighbor List

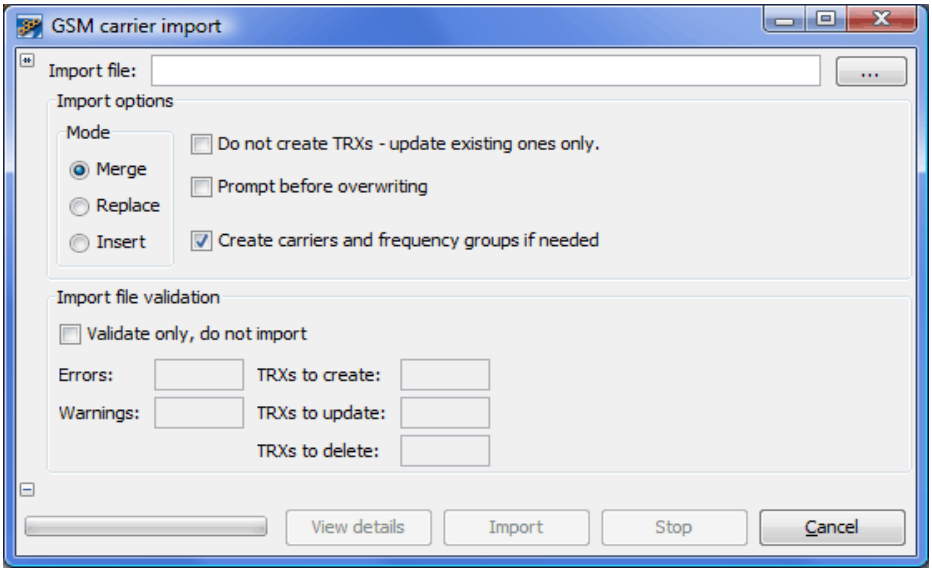
Neighbor information may also be imported from **Analysis↗Neighbor list↗Import to neighbor list** and displayed as a list of generated neighbors. The format of the expected file is a tab separated text file with one row per cell, with the target cell to the left and all its neighbors listed on the row.

This import method is currently only documented in procedure *Import Neighbors to Generated Neighbor List* in the *TEMS CellPlanner LTE User's Guide*, but the procedure is valid for all radio technologies.

Import GSM Carriers Text File

Do as follows to import a GSM carriers text file:

1. Select **File↗Import↗GSM carriers text file.** The **GSM carrier import** window appears:



See Fields on Window "GSM carrier import" on page 18-59.

2. Select import options, and the coordinate system to use for the imported data.
3. To validate the import file without updating the project with imported data, select **Validate only, do not import**.
4. Click **Import** to start the import (or just validation). If just validating, the procedure ends here.

Fields on Window "GSM carrier import"

Import file	Location of GSM carriers text file to import
Import options:	
Mode	• Merge • Replace • Insert
Do not create TRXs - update existing ones only	Indicates that neighbor relations should not be created but updated only
Create carriers and frequency groups if needed	Creates carriers and frequency groups if they do not exist in the import file.
Prompt before overwriting	Indicates that the system should prompt you before overwriting existing data.
Import file validation:	
Validate only, do not import	Validates the data in the import file, and does not import any information into the project.
Errors	Number of errors found during import/validation
Warnings	Number of warnings occurring during import/ validating
TRXs to create	Number of neighbor relations to create
TRXs to update	Number of neighbor relations to update
TRXs to delete	Number of neighbor relations to delete

GSM Carriers Text File Format

The file is tab separated, as created in a spreadsheet application or by the TEMS CellPlanner cell export function, organized with a header section followed by one row for each TRX.

Each line in the import file corresponds to one TRX and contains columns belonging to channel groups. One channel group can contain many TRXs, so columns of the channel group may be repeated for each TRX. Channel group values are the same for each TRX sharing the same channel group. When the values differ, the values in the latest row overwrite previous values.

Attribute Handling

When TEMS CellPlanner finds empty attributes in a text file, it substitutes an initial value for the attributes, and displays a warning regarding the substitution.

The attribute ChannelGroup.isBcch is ignored during import, and the value is calculated.

If a frequency group is not found, the import process tries to find a matching frequency group using the content of frequency group carriers and the TRX hop attribute. A matching frequency group is found if it contains the same carriers, regardless of order, and has the same hopping (synthesizer or non-synthesizer) as the TRXs channel group.

When a new frequency group is created, the hop attribute is set to "On baseband, frequency baseband hopping" if the channel group of the TRX has hop off. Otherwise the frequency group gets the same hop value as the channel group.

Example: GSM Carriers Text File

The following example shows a typical import file format:

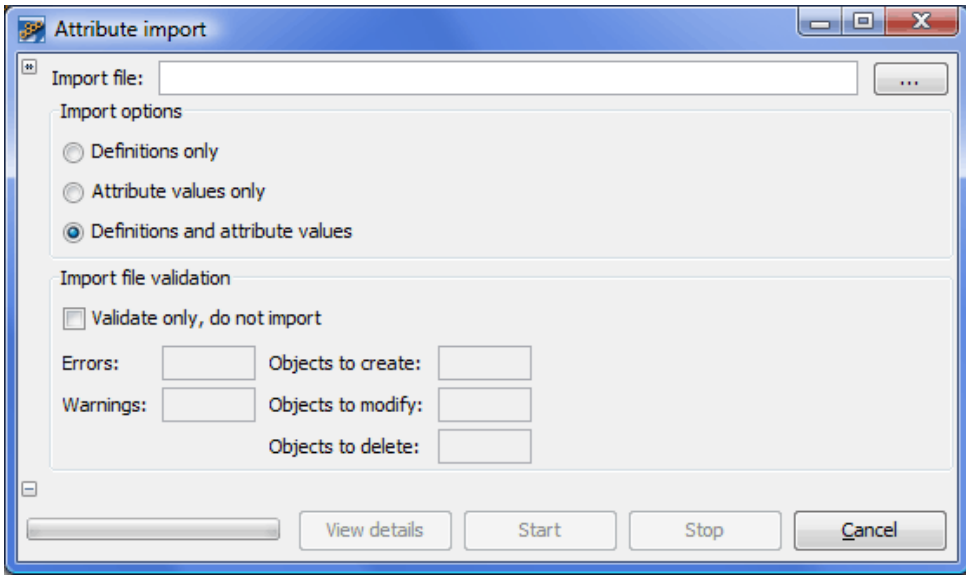
```
Type Carrier
Version 1
Technology GSM

GsmCell.userLabel/GsmOLCell.userLabel/
ChannelGroup.groupNumber/Trx.position ChannelGroup.hop hsn
maioList numOfTimeslotEgprs numOfTimeslotGprsCs3Cs4
Trx.cs3Cs4Capable edgeCapable isBcch isLocked carrier
frequencyGroup FrequencyGroup.carriers
R00001A//0/0 OFF 0  0 0 0 0 0 0 13 FG 123 1,2,3
R00001A//0/1 OFF 0  0 0 0 0 0 0 13 FG 12 1,2
R00001A//1/0 OFF 0  0 0 0 0 0 0 13 FG 123 1,2,3
R00001A/R00001A1/0/0 OFF 0  0 0 0 0 0 0 13 FG 123 1,2,3
```

Import Attribute Text File

Use this procedure to import attribute custom attributes from a text file, see Attribute Text File Format on page 18-62.

Imported attributes can be applied on sites, RBSs or cells.

1. Select **File↗Import↗Attribute text file.** The **Attribute import** window appears as in the following example:



   See Fields on Window "Attribute import" on page 18-62.

2. Select the file to import.
3. Select the kind of import: Definition only, attribute values only, or both.
4. To validate the import file without updating the project with imported data, select **Validate only, do not import**.
5. Click **Start** to initiate the import (or just validation). If just validating, the procedure ends here.
6. If you do not import type definitions, data in the file is validated against the existing type definition in the current project. In cases of mismatch, a warning message is displayed and the import is not performed.

   If you import type definitions, all existing customized attributes for the object including existing definitions are replaced by the imported customized attributes.

Fields on Window “Attribute import”

Import file	File containing attributes to from which to import.
Import options:	
Definitions only	Imports only the attribute definitions.
Attribute values only	Imports only attribute values.
Definitions and attribute values	Imports both attribute definitions and values.
Import file validation:	
Validate only, do not import	Validates the data in the import file, and does not import any information into the project.
Errors	Number of errors found during import/validation.
Warnings	Number of warnings occurring during import or validation.
Objects to create	Number of objects to create during import
Objects to modify	Number of objects to modify during import
Objects to delete	Number of objects to delete during import

Attribute Text File Format

- Format

  The file format is a spreadsheet-like text format containing attributes for a specific network object. One file must contain custom attributes for only one object at a time. The file contains type definitions for the data it contains, and you can import either the definitions or the data, or both.

  Rules:

  - A line is stripped from whitespace characters in the beginning and in the end before being further processed
  - An empty line is ignored (with the exception of marking the end of the type definition section as described below)
  - A line starting with character # is considered a comment line and is ignored
  - A file has always a type definition section and is always followed by a data section (in case the file contains data - a file without data is valid but serves no purpose)

- Attribute type definitions

  There are four kinds of type attribute definitions:

  - Attribute:class:String:attribute name:tooltip text:standard value
  - Attribute:class:Integer:attribute name:tooltip text:standard value:min value:max value
  - Attribute:class:Float:attribute name:tooltip text:standard value:min value:max value:precision
  - Attribute:class:enum type:attribute name:tooltip text:standard value

Where enum type is an enum type definition according to:

```
Enum:enum type:enum value1,enum value2 …
```

Items in italics are custom attribute definitions.

The Type definitions are ended by a blank line and followed by the title row which is on the form:

```
class attributeName1 attributeName2 …
```

The title row contains the class name to the left and attribute names. It serves the purpose of defining the attribute order. All attributes here must be found in the type definition.

- Attribute data

  The data is tab separated fields containing any character except a TAB character. A Tab character in a data field is converted to a space character. Characters not possible to represent in 8-bits are delimiters (, : tab). Other special characters (backslash) are escaped (for example \u12ab).

- Example

  The following example shows an attribute import file format:

```
Enum:Status:Candidate,Planned,On-air,Foo\u bar,Hi there
Attribute:Site:Status:Site status:Candidate
Attribute:Site:Integer:Height:Site height:100:0:1000

Site                                    Status        Height
Site-00001                              Planned       10
Site-00002                              Planned       21
Site-00003                              On-air        55
```

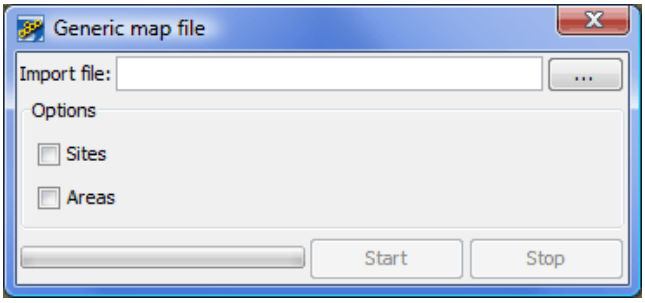
Map Files

Import Generic Map File

Generic map files contain polygon defined areas, possibly including sites.

Do as follows to import generic map files:

1. Select **File↗Import↗Generic map file.** The **Generic map file** window appears:



2. Select option **Sites** to import site information.
3. Select option **Areas** to import areas.
4. Click **Start** to import the file.

Fields on Window "Generic map file"

Import file	The name and location of the map data file to import
Sites	Selects to import site information
Areas	Selects to import area information

Subscriber Files

Fixed subscribers are terminals with a fixed position in LTE or WiMAX network plans, see *TEMS CellPlanner LTE User's Guide* and *TEMS CellPlanner WiMAX User's Guide*.

You can define your fixed subscribers in tab separated text format and import the file into TEMS CellPlanner to include the fixed subscribers in the analysis.

Import Fixed Subscribers

Use this procedure to import fixed subscribers together with their site information. All sites in the import file are imported.

File Format

The format of the fixed subscriber file is described in the *TEMS CellPlanner Common Features Technical Reference Manual*.

Prerequisites

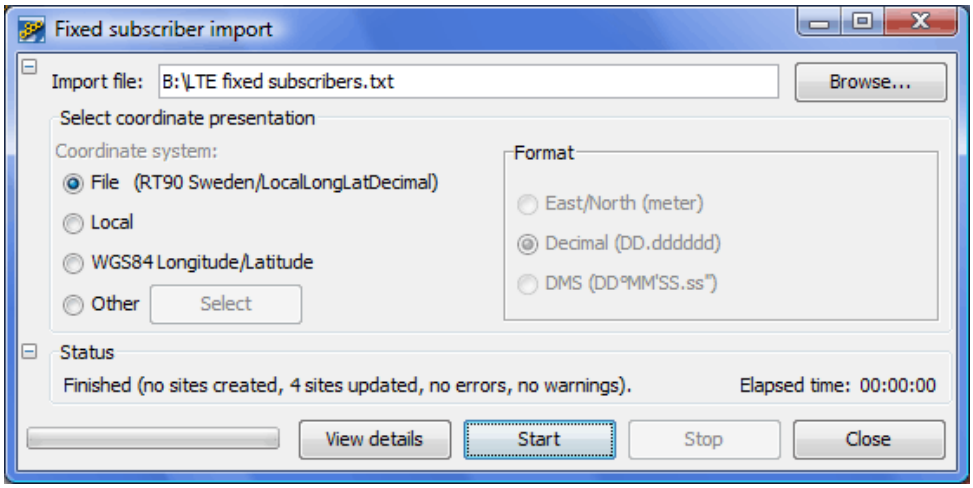
- A file in expected File Format with LTE or WiMAX fixed subscribers is available
- An LTE or WiMAX project is opened

Procedure

Follow these steps to import fixed subscribers:

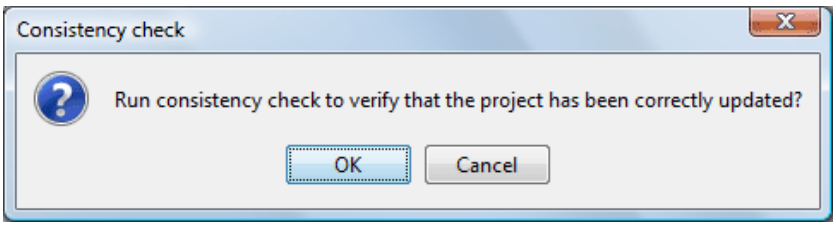
1. Select File↗Import↗Fixed subscribers text file... The Fixed subscriber import window is displayed.
2. Select the file to import. If the file is not a valid fixed subscriber file, a warning message is displayed.
3. Select the coordinate presentation to use for the imported data. By default, the coordinate system and format of the import file is selected.
4. Click **Start**. The import of the specified file begins and the Status field displays the progress.

5. When the import completes, the Status field tells that the import is Finished, and the **View details** button is enabled. The **Fixed subscriber import** window then looks as in the following example:



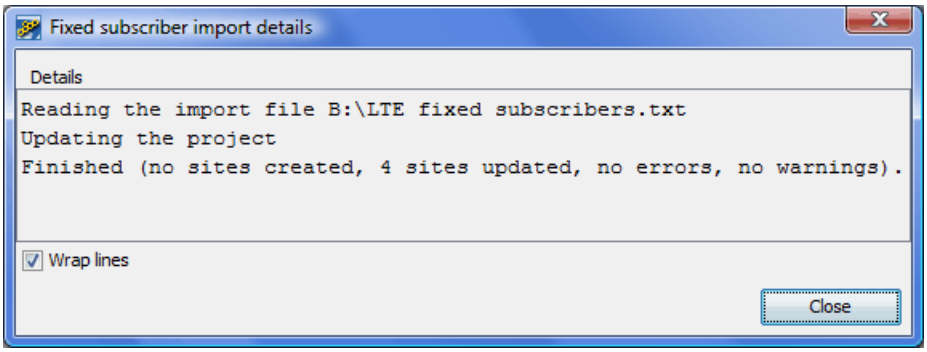
6. You are prompted to run a consistency check.

   Note: *It is strongly recommended to check the consistency. Inconsistent import data might destroy your loaded project.*



7. Click **OK** to Check Project Consistency.

8. To check the result of the import, click **View details**. The **Fixed subscriber import details** appears:


Fixed subscriber import details
Details
Reading the import file B:\LTE fixed subscribers.txt
Updating the project
Finished (no sites created, 4 sites updated, no errors, no warnings).
Wrap lines
Close

The Details window displays if any attributes were missing in the import file, and if the import recovered in any way from the missing information. See *"Import Rules of Fixed Subscribers File"* in the *TEMS CellPlanner Common Features Technical Reference Manual*.

Fields on Window "Fixed subscriber import"

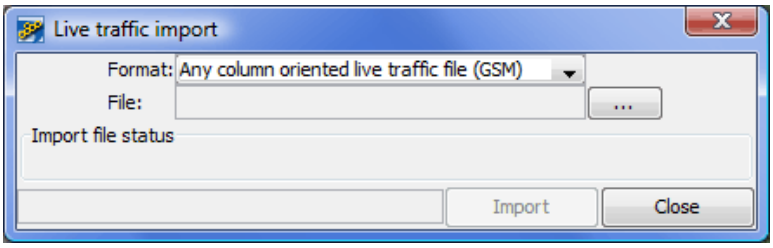
Import file	Location of fixed subscribers text file to import
Select coordinate presentation	The coordinate system and format to apply to the fixed subscriber site positions. Coordinate system: • File - select this option (default) if a coordinate system is included in the import file. After the import, the import file's coordinate system is displayed together with this option. • Local • WGS84 Longitude/Latitude • Other - select from list of supported coordinate reference systems in TEMS CellPlanner Format: • East/North (meter) • Decimal (DD.dddddd) • DMS (DD°MM'SS.ss")
View details	Shows number of imported fixed subscribers
Start	Starts the import process
Stop	Stops the import process
Close	Stops any ongoing import and closes the import window

Live Traffic

Import Live Traffic

Do as follows to import live traffic data into TEMS CellPlanner:

1. Select File↗Import↗Live traffic text file. The **Live traffic import** window appears:



2. Click ... and browse to the file to import.
3. Click **Import** to start importing the file.

Fields on Window "Live traffic import"

Format	Format to use for live traffic import. Options include: • Any column oriented live traffic file (GSM) • Any column or • NMS live traffic file (GSM)
File	Location of live traffic file to import
Import file status	Status of the live traffic import process
Import	Starts the import process.

19
Exporting Data

This chapter describes procedures for exporting data from TEMS CellPlanner to other applications.

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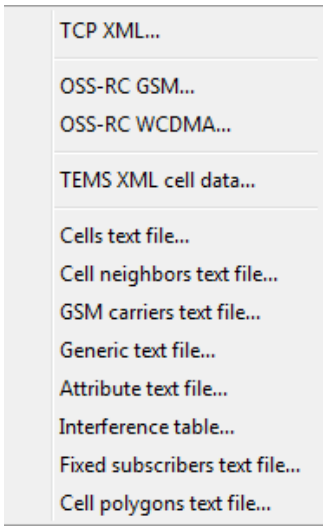
About Exporting Data from TEMS CellPlanner

By using the **File↗Export** menu you can export data to other applications:



The export options are as follows:

- TCP XML — Exports TEMS CellPlanner project to an XML file
- OSS-RC GSM — Exports GSM network data to a CNAI file
- OSS-RC WCDMA — Exports WCDMA network data to a Bulk CM file
- TEMS XML cell data — Exports cell data to an XML file
- Cells text file — Exports cell data to a text file
- Cell neighbors text file — Exports neighbor relations of any radio technology to a text file
- GSM carriers text file — Exports GSM carrier data to a text file
- Generic text file — Exports project data to a generic text file
- Attribute text file — Exports custom attributes to a text file
- Interference table — Exports interference tables
- Fixed subscribers text file — Exports LTE or WiMAX fixed subscribers to a text file
- Cell polygons text file — Exports WCDMA cell polygons to a text file

Project XML Files

A TEMS CellPlanner project can be saved either in TEMS CellPlanner proprietary format or in readable XML format. For compatibility reasons, a TEMS CellPlanner project must be exported to XML format if you want to use it in another TEMS CellPlanner version. There are two ways of exporting projects to XML format:

- Export Project Files from TEMS CellPlanner Client.
  This is the most common case, used when projects are stored on the local computer or on a Citrix server.
- Export Projects in Database from TEMS CellPlanner Server.
  This is the most practical method to export projects stored on a TEMS CellPlanner Server. An authorized administrator may export multiple projects and optionally account information of all users at the same time.

Export Project Files from TEMS CellPlanner Client

Use this procedure to export a TEMS CellPlanner project from a TEMS CellPlanner Client (or a Citrix server) to an XML file.

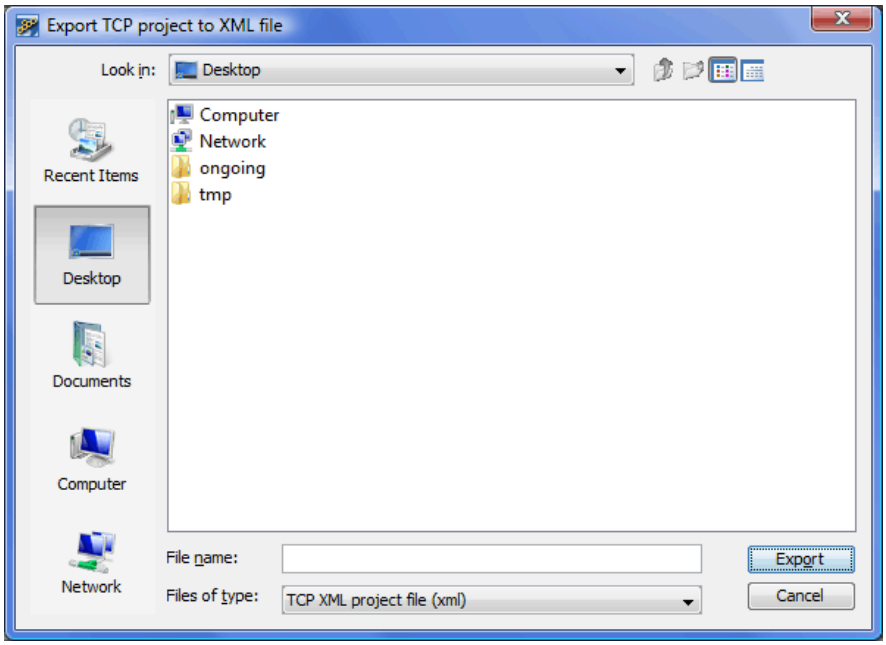
The account information - project user, user groups and permissions - of the user exporting the project is included in the export. No information about other project users is exported.

To export a project stored in database, follow instead the instructions in Export Projects in Database from TEMS CellPlanner Server.

Procedure

To export a project from a TEMS CellPlanner Client, do as follows:

1. Select **File↗Export↗TCP XML**. The **Export TCP project to XML file** window appears.



2. Select a folder and file name for the exported project.
3. Click **Export**. The loaded project is stored in the file specified.

Fields on Window "Export TCP project to XML file"

File name	Name of the file to export. If the file does not already exist, you may enter a file name.
Files of type	File type must be TEMS CellPlanner XML project file (.xml extension)

Export Projects in Database from TEMS CellPlanner Server

Use this procedure to export the main workspace of TEMS CellPlanner projects in database to XML files. You may export several projects at the same time.

Account information - project users, user groups and permissions associated with the exported project - may be selected to include in the export.

Prerequisites

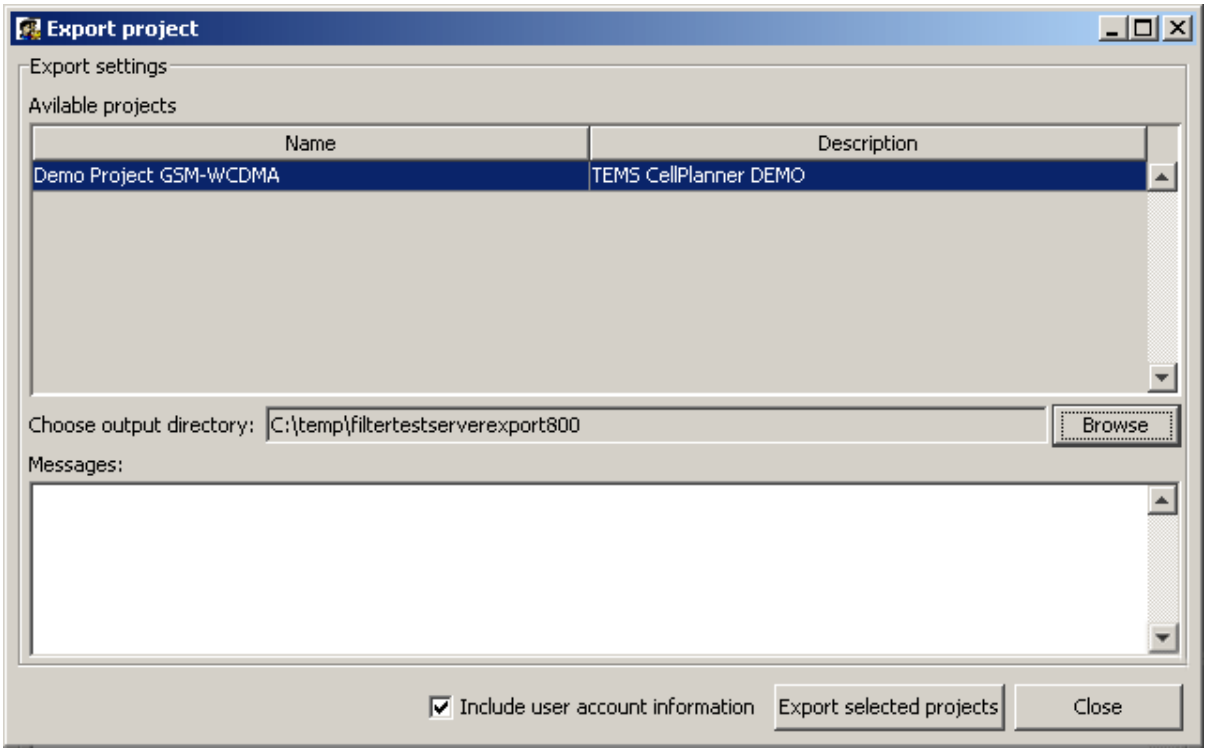
- You are an authorized administrator of the TEMS CellPlanner Server.
- The project to be exported is saved in the database.

- All users have published their changes from their private workspaces prior to the export to ensure that all data is included in the export file.
- The TEMS CellPlanner Server is started.

Procedure

To export projects in database, optionally with account information, do as follows:

1. Login to the User Administration Tool
2. From the **Project** menu, select **Export Project**. The **Export project** window is displayed.



3. Select the project(s) to export by highlighting their names in the window.
4. Select the **User account information** option if you want to export all metadata of the project, including user account information, otherwise clear the option.
5. Browse or enter the name of the target XML directory and click **OK**.
   A progress status dialog with one bar per project displays the status of the export.
6. When the export is completed, the selected project(s), optionally with account information, are exported to the target directory. Each XML file gets the same name as the project name.

Fields on Window “Export project”

Name	Project name
Description	Description of project
Choose output directory	The target folder for the exported project.
Include user account information	If selected, account information of the project is exported: • Users • User groups • Project and site permissions The following metadata is always included in the export: • Information model (internal data structures) version • Import type, used at import, to know which information to find in the file. Set to `TCPServer` when exported using this procedure. (When exported from the client, the import type is `TCP)`. • User id of the exporting user • Version and build number of the TEMS CellPlanner Server • Date and time of the export
Messages	Result of the export.

OSS-RC GSM Network Data

Exporting GSM Network Data to OSS-RC

By OSS-RC GSM Export you can deploy a network design planned in TEMS CellPlanner to a real GSM network managed by OSS-RC. During initial tuning or network optimization it can be used to implement parameter changes planned in TEMS CellPlanner to the live network.

You can export all sites from the project or apply a filter or selection to only export selected sites. You can choose to export all cell parameters or only some selected ones, for example power, carriers, neighbors, and so forth.

OSS-RC GSM Export creates a so-called *CNAI file*, hence this export method is also called *CNAI export*. The CNAI file can be imported directly to a Planned Area in OSS-RC. OSS-RC will take care of updating all the relevant network nodes when the Planned Area is activated.

Consistency checks are provided to validate that parameter values are within the correct range allowed in the BSC, and that limits on maximum number of cells and cell relations per BSC are not exceeded. These checks also take the BSC version into account since certain parameters have a different range in different BSC versions.

About CNAI files

Two Versions of CNAI File Format

OSS-RC provides two different versions of the CNAI file format: "old" CNAI format and "new" CNAI format. The two formats convey exactly the same information but they look completely different and are not compatible with each other.

Note: *TEMS CellPlanner supports the "new" CNAI format only. Earlier releases of TEMS CellPlanner supported the "old" CNAI format. In TEMS CellPlanner 9.0 the OSS-RC GSM Import/Export was redesigned and it now supports the "new" CNAI format. CNAI files used with TEMS CellPlanner 8.1 and earlier versions cannot be imported to TEMS CellPlanner 9.0 and higher versions.*

How to Import a "New" CNAI File to OSS-RC

Use the following shell command on the OSS-RC server to import a "new" CNAI file produced by TEMS CellPlanner into a Planned Area:

```
cnai import user:areaname -i < filename
```

Note: *The shell command used for "new" CNAI files is different from the one used for "old" CNAI files. It is important to use the right shell command otherwise OSS-RC will not be able to import the file.*

Where to Read More

For more details on the "new" CNAI file format, see the OSS-RC CPI document CNAI, CNA Interface Interwork Description, 1/155 19-APR 901 0143.

Note the 1/ prefix in the document number. The same document number without prefix is the description of the "old" CNAI file format.

For more details on how to export CNAI files from OSS-RC, see the OSS-RC CPI document CNAI, CNA Interface, User Guide, 1/1553-APR 901 0143.

Note: *"New" CNAI is simply called "CNAI" in the OSS-RC CPI, while "old" CNAI is called "old CNAI".*

Supported GSM RAN Versions

TEMS CellPlanner 9.0 supports GSM BSC versions R10 through R12 and 06A through 09A.

OSS-RC GSM Export will use the same BSC version number as the one stored in the BSC Custom attribute VERSION during OSS-RC GSM Import. For BSCs manually created in TEMS CellPlanner (that is, not imported from OSS-RC), the version number can be entered manually in Custom attribute VERSION, or a default BSC version can be provided in the OSS-RC GSM Export window.

What Can Be Exported

The following OSS-RC objects can be exported from TEMS CellPlanner:

- Subnetwork
- BSC
- SITE
- TG (Transceiver group)
- INTERNAL_CELL (GSM cell)
- OVERLAID_SUBCELL
- CHANNEL_GROUP
- NREL (GSM neighbor relation)
- UTRAN_NREL (UTRAN neighbor relation)
- RNC
- EXTERNAL_UTRAN_CELL

For a detailed list on exportable parameters, see *Parameters to export* in Fields on Window "Export OSS-RC GSM network data" on page 19-13

Prerequisites for OSS-RC GSM Export

A GSM Subnetwork containing one or more BSCs must be created in the TEMS CellPlanner project using the Network Explorer. Each GSM RBS you wish to export must be connected to the appropriate BSC.

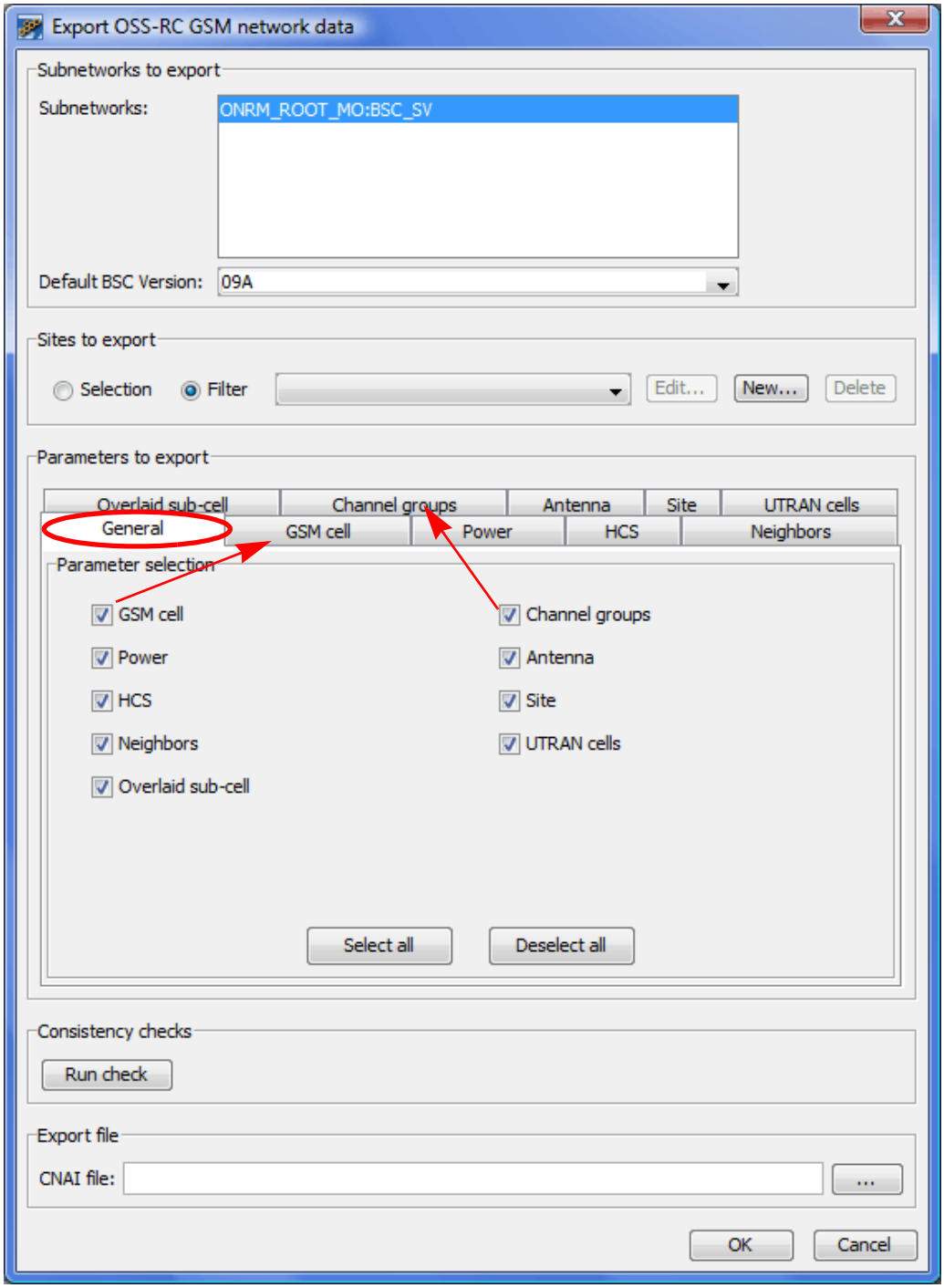
The Subnetwork and each BSC must have the same name as the Managed Object id of the corresponding Subnetwork or BSC in OSS-RC.

Process: How to Export GSM Network Data to OSS-RC

When the Prerequisites for OSS-RC GSM Export are met, do as follows to export GSM network data to a CNAI file:

1. Ensure project consistency, see Check Project Consistency on page 3-22.

2. Select **File↗Export↗OSS-RC GSM**. The **Export OSS-RC GSM network data** window with its **General** tab appears as in the example below.



3. Select one or more subnetworks to export. Only GSM subnetworks are selectable.

4. Select the sites to export by individual selection or using a filter. If no filter or selection is specified, all sites in the selected subnetwork(s) will be exported.
5. From the General tab, select the parameter groups you wish to export, for example GSM cell, Power, HCS, and so on. The corresponding tabs become enabled and all their parameters are selected.
6. Select or deselect individual parameters under each tab. By default all parameters on an enabled tab are selected, and all parameters on a disabled tab are unselected.

   Note: *Only the selected parameters will be exported to the CNAI file. The unselected parameters will not be modified in the network.*

7. Recommended: Click **Run check** to validate that the data you are exporting complies to value ranges and limits allowed in the BSC. If there are errors, you should fix them before proceeding with the export.

   Note: *This consistency check is different from the Project consistency check in* Step 1*.*

8. Enter the path and file name for the CNAI export file.

   Note: *Enter a **new** file name (normal case) to create a new export file. If you select an existing file, you will be asked if you wish to overwrite it.*

9. Click **OK**. TEMS CellPlanner creates the CNAI file containing the selected sites and parameters. A message pops up to confirm that export has finished.

Fields on Window "Export OSS-RC GSM network data"

Subnetworks	Subnetwork(s) to export, selected from a list of subnetworks.
Default BSC version	BSC version to be used for BSCs without a VERSION Custom attribute set
Sites to export	Selects the sites to export by: • Selection - using selected sites in the project • Filter - using a pre-defined filter If nothing is selected, all sites in the selected subnetwork(s) will be exported.
Parameters to export	
General tab	Select groups of OSS-RC parameters to export: • GSM cell • Power • HCS • Neighbors • Overlaid sub-cell • Channel groups • Antenna • Site • UTRAN cells If a parameter group is selected, then the corresponding window tab is enabled and all parameters on that tab are automatically selected for export. If a parameter group is unselected, then the corresponding window tab is disabled and all parameters on that tab are automatically unselected. • Select all - Selects all parameters in all parameter groups • Deselect all - Unselects all parameters in all parameter groups ***Note:*** *The **UTRAN cells** option is selectable only if you have a WCDMA license and have selected WCDMA in the Application Preferences.*
All tabs except General	• Select all - Selects all parameters in the current tab window • Deselect all - Unselects all parameters in the current tab window

GSM cell tab	Select GSM cell parameters to export: • Cell ID Selects/deselects INTERNAL_CELL parameter *CI*. • Max timing advance (TA) Selects/deselects INTERNAL_CELL parameter *TAOL*. • Extended Range Selects/deselects INTERNAL_CELL parameter *XRANGE*. • GPRS enabled Selects/deselects INTERNAL_CELL parameters *GPRSSUP and SCALLOC*. • MCC Selects/deselects INTERNAL_CELL parameter *MCC*. • MNC Selects/deselects INTERNAL_CELL parameter *MNC*. • Location area (LAC) Selects/deselects INTERNAL_CELL parameter *LAC*. • BCC Selects/deselects INTERNAL_CELL parameter *BCC*. • NCC Selects/deselects INTERNAL_CELL parameter *NCC*. • Permitted NCCs Selects/deselects INTERNAL_CELL parameter *NCCPERM*. • Copy BCC to TSC Selects/deselects INTERNAL_CELL parameter *CP_BCC_TSC*.
Power tab	Select power parameters to export: • Tx power Selects/deselects INTERNAL_CELL parameter *BSTXPWR* • Power offset Selects/deselects INTERNAL_CELL parameter *SSOFFSETDL* • Power control enabled Selects/deselects INTERNAL_CELL parameter *DYNBTSPWR_STATE* • DTX enabled Selects/deselects INTERNAL_CELL parameter *DTXD* • Min Rx level Selects/deselects INTERNAL_CELL parameter *ACCMIN*
HCS tab	Select HCS parameters to export: • HCS bands Selects/deselects BSC parameter *HCSBAND* • HCS band thresholds Selects/deselects BSC parameter *HCSBANDTHR* • HCS layers Selects/deselects BSC parameter *LAYER* • HCS layer thresholds Selects/deselects BSC parameter *LAYERTHR*

Neighbors tab Select the neighbor relations to export:

- GSM neighbors
  Selects/deselects NREL (GSM neighbor relations).
- UTRAN neighbors
  Selects/deselects UTRAN_NREL (UTRAN neighbor relations), RNC and UTRAN_CELL.

Note: *The **UTRAN neighbors** option is selectable only if you have a WCDMA license and have selected WCDMA in the Application Preferences.*

Overlaid sub-cell tab Select overlaid sub-cell parameters to export:

- Tx power
  Selects/deselects OVERLAID_SUBCELL parameter *BSTXPWR*
- Max pathloss threshold
  Selects/deselects OVERLAID_SUBCELL parameter *LOL*
- Power offset
  Selects/deselects OVERLAID_SUBCELL parameter *SSOFFSETDL*
- Max timing advance (TA)
  Selects/deselects OVERLAID_SUBCELL parameter *TAOL*

Channel groups tab Select channel group parameters to export:

- BCCH carrier
  Selects/deselects INTERNAL_CELL parameter *BCCHNO*
- TCH carriers
  Selects/deselects CHANNEL_GROUP parameters *DCHNO*, *HOP* and *NUMREQBPC* alt. INTERNAL_CELL parameter *DCHNO*
- Timeslot GPRS CS3 and CS4
  Selects/deselects CHANNEL_GROUP parameter *NUMREQCS3CS4BPC*
- Timeslot EGPRS
  Selects/deselects CHANNEL_GROUP parameter *NUMREQEGPRSBPC*
- HSN
  Selects/deselects CHANNEL_GROUP parameter *HSN*
- MAIO
  Selects/deselects CHANNEL_GROUP parameter *MAIO*
- TSC
  System version, thus CNAI format (new or old), dependant parameter selection.
  - Selects/deselects CHANNEL_GROUP parameter *TSC* ("new")
  - Selects/deselects INTERNAL_CELL parameter *TSC* and OVERLAID_SUBCELL parameter *TSC* ("old")

Antenna tab Select antenna parameters to export:

- Antenna beam type
  Selects/deselects INTERNAL_CELL parameter *ANTENNA_TYPE*
- Antenna position
  Selects/deselects INTERNAL_CELL parameters *LATITUDE* and *LONGITUDE*
- Antenna height AGL
  Selects/deselects INTERNAL_CELL parameter *HEIGHT*
- Antenna azimuth
  Selects/deselects INTERNAL_CELL parameter *CELL_DIR*
- Mechanical downtilt
  System version, thus CNAI format (new or old), dependant parameter selection.
  - Selects/deselects INTERNAL_CELL parameter *ANTENNA_TILT* ("new")
  - Selects/deselects INTERNAL_CELL parameter *TILT* ("old")

Site tab	Select site parameters to export: • Site position Selects/deselects SITE parameters *LONGITUDE and LATITUDE*. • Ground height Selects/deselects SITE parameter *ALTITUDE*.
UTRAN Cell tab	Select UTRAN cell parameters to export: • Cell ID Selects/deselects UTRAN_CELL parameter *CI*. • RNC ID Selects/deselects UTRAN_CELL parameter *RNCID*. • MCC Selects/deselects UTRAN_CELL parameter *MCC*. • MNC Selects/deselects UTRAN_CELL parameter *MNC*. • LAC Selects/deselects UTRAN_CELL parameter *LAC*. • UARFCN downlink Selects/deselects UTRAN_CELL parameter *FDDARFCN*. • Primary scrambling code Selects/deselects UTRAN_CELL parameter *SCRCODE*. • Primary CPICH power Selects/deselects UTRAN_CELL parameter *PRIMARYCPICHPOWER*. • Antenna beam type Selects/deselects UTRAN_CELL parameter *ANTENNABEAMTYPE*. • Antenna position Selects/deselects UTRAN_CELL parameters *LATITUDE and LONGITUDE*. • Antenna azimuth Selects/deselects UTRAN_CELL parameter *BEAMDIRECTION*.
Run check	Validate that parameter values are within the correct range and that maximum number of cells and cell relations per BSC are not exceeded.
CNAI file	Name of the file to be created by the export.

OSS-RC WCDMA Network Data

Exporting WCDMA Network Data to OSS-RC

TEMS CellPlanner is often used during network tuning to plan/simulate parameter changes before deploying then in the real network. Deploying the planned changes manually to a large number of network nodes can be cumbersome and costly. Moreover, tuning is often an iterative process, where several reconfigurations are needed until the optimal configuration is obtained. To make this process easier, TEMS CellPlanner provides this function to export the planned changes into a so called Bulk CM file, which can be imported directly into OSS-RC. OSS-RC will then take care of updating all the network nodes with the relevant data.

This section describes the ***Bulk CM export***, that is, how to export the WCMDA network data to a Bulk CM file that can be imported into OSS-RC.

About Bulk CM Export

The purpose of Bulk CM Export is to deploy parameter changes planned in TEMS CellPlanner into the live WCDMA network. You can export an entire subnetwork or selected Sites only. You can also select specific parameters that you would like to export, for example scrambling codes, neighbors, power, HSDPA, EUL, MBMS parameters and so on. Bulk CM Export applies to WCDMA networks only.

Note: *Due to limitations of the Bulk CM interface in OSS-RC (see below), Bulk CM Export cannot be used as a roll-out/integration tool for new sites or nodes. It can only be used to update the configuration of nodes that already exist in OSS-RC. In other words, it is not possible to export sites that have only been created in TEMS CellPlanner but not in OSS-RC. A Bulk CM import from an existing network must have been performed first before a Bulk CM export can take place.*

Supported OSS-RC Versions

TEMS CellPlanner 9.0 supports the export of Bulk CM files for OSS-RC versions R4, R5.2, R5.3, R6.1, R6.2, R6.3 and R7.1. The general rule is that the Bulk CM export file is created for the same OSS-RC version as the one used for the Bulk CM import of the relevant Subnetwork.

Limitations of OSS-RC Bulk CM Interface

The Bulk CM interface specification, as defined by OSS-RC, imposes restrictions on which MOs can be created, deleted and updated in OSS-RC. In particular, the top-level objects representing Subnetwork, RNC and RBS are read-only or 'update-only', which means that they cannot be created or deleted via the Bulk CM interface. The Bulk CM interface can only be used to *update* Subnetworks, RNCs and RBSs that

already exist in OSS-RC. Other examples of read-only objects are the RBS antenna equipment, such as Antennas, Feeder cables, Tmas, and so forth. This is the reason why the Antenna equipment parameters can only be imported but not exported.

For example, if new Sites have been planned in TEMS CellPlanner, it is not possible to use Bulk CM Export to create the corresponding MOs in OSS-RC. The MOs must be created in OSS-RC (or in the nodes) by the usual tools used for roll-out and integration (CDRs, MoScripts, and so on). When the MOs have been created in OSS-RC, a Bulk CM Import must be performed, to import the IDs of the new MOs into TEMS CellPlanner. It is only after this initial import that you can perform a Bulk CM Export, since the export file must contain the correct MO IDs for OSS-RC to understand which MOs we wish o update. The MO IDs are stored in TEMS CellPlanner as Custom Attributes in the Subnetwork, Rnc, Rbs, Sector, UtranCell objects, and so forth.

See OSS-RC WCDMA Network Data on page 18-25 for instructions on how to import a Bulk CM file into TEMS CellPlanner.

Prerequisites for Bulk CM Export

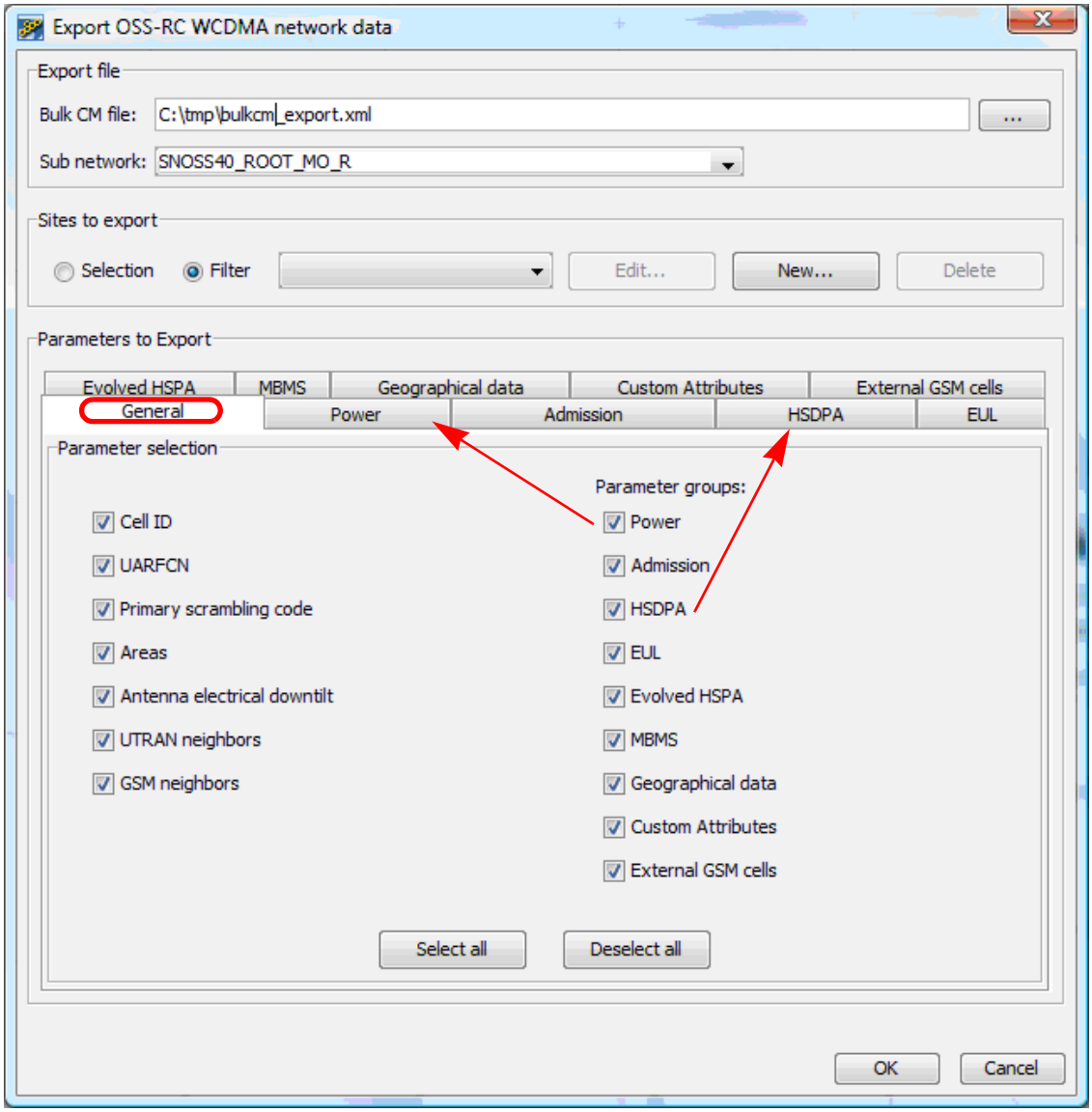
The OSS-RC identities of the Subnetwork, RNCs, RBSs, sectors, and so on, must be known in the TEMS CellPlanner project to create a valid Bulk CM file importable by OSS-RC. Due to this, you must have **imported** the Subnetwork from OSS-RC at least once **before** you can export a TEMS CellPlanner project for the **first time**. See Limitations of OSS-RC Bulk CM Interface on page 19-17.

The OSS-RC identities can be imported to TEMS CellPlanner using OSS-RC WCDMA Network Data on page 18-25.

Procedure for Bulk CM Export

When the Prerequisites for Bulk CM Export are met, do as follows to export WCDMA network data to a Bulk CM file:

1. Select **File↗Export↗OSS-RC WCDMA**. The **Export OSS-RC WCDMA network data** window with its **General** tab appears as in the example below.



See Fields on Window "Export OSS-RC WCDMA network data" on page 19-20 for details about the window.

2. Enter the path and file name for the Bulk CM export file.

   Note: *Enter a **new** file name (normal case) to create a new export file. If you select an existing file, you will be asked if you wish to overwrite it.*

3. Select the subnetwork to export.

Note: *Only subnetworks previously imported from OSS-RC are available for selection. If no subnetwork choice appears you are probably trying to export a configuration that has not yet been imported from OSS-RC. See* Limitations of OSS-RC Bulk CM Interface *on page 19-17.*

4. Select the set of sites to export by individual selection or using a filter. If no filter or selection is specified, all sites in the subnetwork will be exported.
5. From the General tab, select the parameters you wish to export, for example Cell ID, UARFCN, Scrambling code, and so on. Under **Parameter groups**, select the parameter groups to export. The corresponding tabs become enabled and all their parameters are by default selected.
6. Select or deselect individual parameters under each tab: **Power**, **Admission**, **HDPA**, **EUL**, **Evolved HSPA**, **MBMS**, **Geographical data**, **Custom Attributes** and **External GSM cells**.
7. Click **OK**. TEMS CellPlanner creates the Bulk CM file containing the selected sites and parameters.

Fields on Window "Export OSS-RC WCDMA network data"

Bulk CM file	Name of the file to be created by the Bulk CM export.
Sub network	Subnetwork to export, selected from a list of subnetworks.
Sites to export	Selects sites to export by: • Selection - using selected sites in the project • Filter - using a pre-defined filter
Parameters to export	
All tabs	• Select all - Selects all selectable options in the tab window • Deselect all - Clears all options in the tab window

General tab

Parameter selection

General parameters selectable for export.

- Cell ID
  Selects/deselects RNC cell parameter *cId*
- UARFCN
  Selects/deselects RNC cell parameters *uarFcnDl* and *uarFcnUl*
- Primary scrambling code
  Selects/deselects RNC cell parameter *primaryScramblingCode*
- Areas
  Selects/deselects RNC cell parameters *lac*, *sac* and *rac*. When deselected, *Location areas*, *Routing areas* and *Service areas* will not be exported either.
- Antenna electrical downtilt
  Selects/deselects remote electrical tilt; RBS RetDevice parameter *electricalAntennaTilt*
- UTRAN neighbors
- GSM neighbors, see Note

Note: *The **GSM neighbors** option is selectable only if you have a GSM license and have selected GSM in the Application Preferences.*

Parameter groups

Groups of parameters to enable or disable for selection.

If a parameter group is selected, its corresponding window tab is enabled and all its parameters are automatically selected for export to the Bulk CM file:

- Power
- Admission
- HSDPA, see Note
- EUL, see Note
- Evolved HSPA
- MBMS
- Geographical data
- Custom Attributes
- External GSM cells

Note: *The **HSDPA EUL** and **Evolved HSPA** parameter groups are selectable only if you have an HSDPA license and have selected WCDMA, HSDPA in the Application Preferences.*

Power tab

Power parameters selectable for export.

See Power tab in Fields on Window "Import OSS-RC WCDMA network data" on page 18-31.

Admission tab

Admission control parameters selectable for export.

See Admission tab in Fields on Window "Import OSS-RC WCDMA network data" on page 18-31.

HSDPA tab	HSDPA parameters selectable for export See HSDPA tab in Fields on Window "Import OSS-RC WCDMA network data" on page 18-31
EUL tab	EUL parameters selectable for export. See EUL tab in Fields on Window "Import OSS-RC WCDMA network data" on page 18-31
Evolved HSPA tab	Evolved HSPA parameters selectable for export. See Evolved HSPA tab in Fields on Window "Import OSS-RC WCDMA network data" on page 18-31.
MBMS tab	MBMS parameters selectable for export. See MBMS tab in Fields on Window "Import OSS-RC WCDMA network data" on page 18-31
Geographical data tab	Geographical data selectable for export. • Antenna position Selects/deselects RBS Sector parameters *longitude, latitude, latHemisphere* and *geoDatum* • Antenna height AGL Selects/deselects RBS Sector parameter *height* • Antenna azimuth Selects/deselects RBS Sector parameter *beamDirection* • Cell polygon Selects/deselects RNC cell parameter *utranCellPosition*
Custom Attributes tab	Custom Attributes parameters selectable for export. See Custom Attributes tab in Fields on Window "Import OSS-RC WCDMA network data" on page 18-31
External GSM cells	External GSM cell parameters selectable for export. • Cell ID Selects/deselects ExternalGsmCell parameters *cellIdentity* • Location area code Selects/deselects ExternalGsmCell parameter *lac* • Network color code Selects/deselects ExternalGsmCell parameter *ncc* • Base station color code Selects/deselects ExternalGsmCell parameter *bcc* • BCCH carrier Selects/deselects ExternalGsmCell parameters *bcchFrequency* • GSM band indicator Selects/deselects ExternalGsmCell parameter *bandIndicator* • MS max TX power UL Selects/deselects ExternalGsmCell parameter *maxTxPowerUl* • Min RX level Selects/deselects ExternalGsmCell parameter *qRxLevMin*

TEMS XML Cell Data

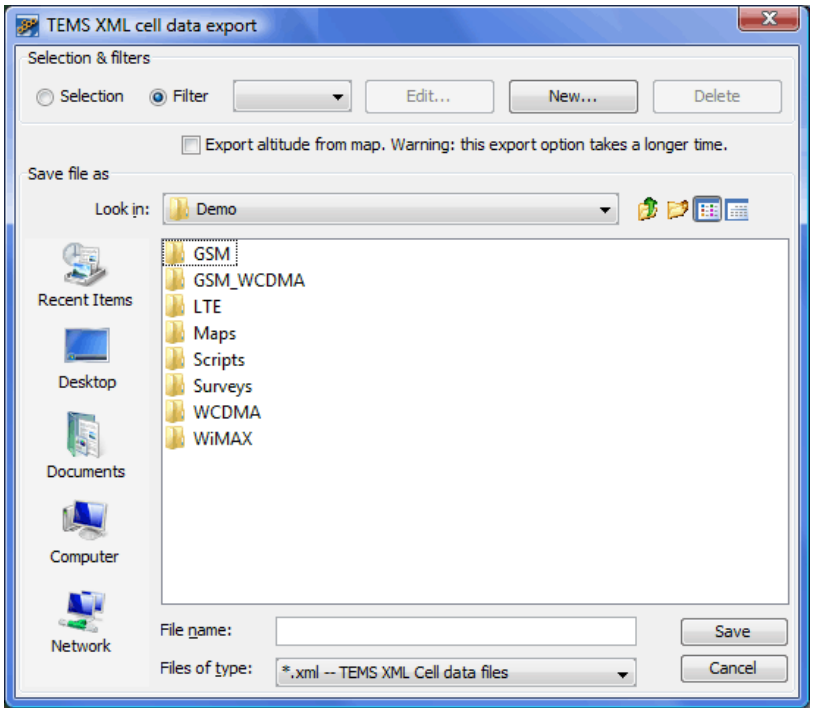
You can export LTE, WCDMA and GSM cell data from a TEMS CellPlanner project to an XML file. TEMS optimization and tuning tools can import this *TEMS XML cell data file* to use the same cell names and positions as in TEMS CellPlanner.

See TEMS Products on page 17-2 for information on how other TEMS tools use cell data from TEMS CellPlanner.

Export TEMS XML Cell Data

Do as follows to export cell data to a TEMS XML cell data file:

1. Select **File↗Export↗TEMS XML cell data:**



2. Optionally limit the cell data to export by using a **Selection** or **Filter**.
3. Browse to a folder and enter a target file name.
4. Click **Save** to export the cell data.

Fields on Window "TEMS XML cell data export"

Export altitude from map	Exports the altitude for each cell based on the map data. Enabling this option increases the processing time.
File name	Name of target file, should be different from the project file name
Files of type	Must be TEMS CellPlanner XML project file (.xml extension)

Cells Text Files

You can export LTE, WCDMA or GSM cell data from a TEMS CellPlanner project to a tab-separated text file like .txt or .xls. This *cells text file* can be used for review only, or be processed and imported into the same or another project.
A cells text file with RBSs and sites can even be imported into an empty project.

Attributes of network elements like sites, RBSs, sectors, cells, antenna branches, antennas, radio repeaters, ASCs, TMAs, feeder cables, frequency bands, and propagation models, can be exported.

The cells text export has the following limitations:

- You can only export cell data of one radio technology at a time.
  Cell data of different technologies must be exported to different files.
- Exported cell data is only granted to be importable into a TEMS CellPlanner Client of the same version as the one used for export. To export/import data between different TEMS CellPlanner versions, use Project XML Files.

See also Cells Text File Format and Examples of Cells Text Files.

Export Cells Text File

Use this procedure to export LTE, WCDMA or GSM cell data to a text file.

Prerequisites

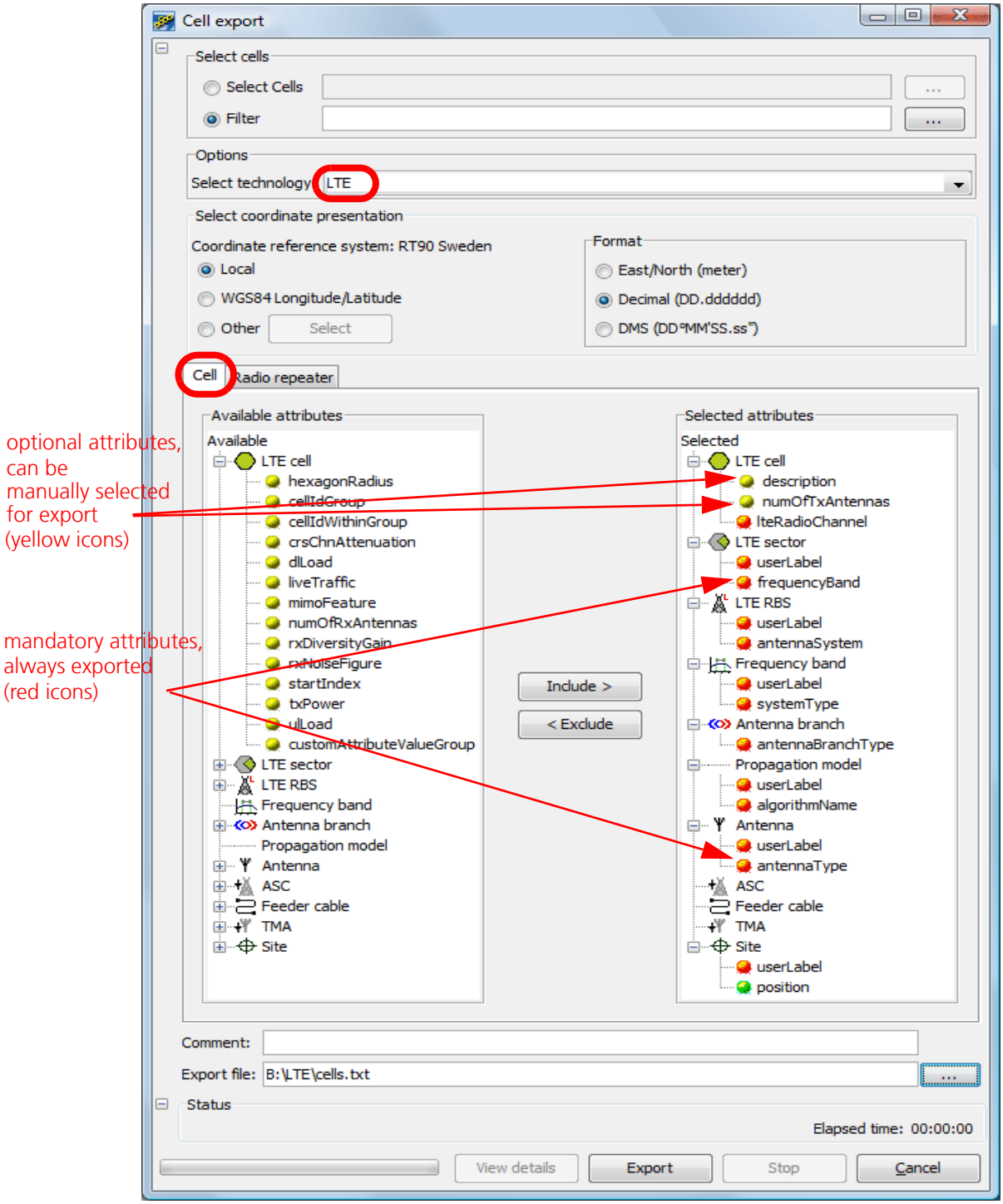
- An LTE, WCDMA or GSM project is opened.
- All exported cell names must be unique to be importable.
- Check the limitations, see above.

Procedure

1. Select **File↗Export↗Cells text file**. The **Cell export** window is displayed.
2. Optionally delimit your export by setting a filter or selecting cells.
3. Select technology - LTE, WCDMA or GSM - of attributes to export. The network elements of the selected technology appear in the lists **Available attributes** and **Selected attributes**.
4. Select coordinate system and format.
5. If the data you export shall be importable into an empty project, RBSs and sites must be exported.
6. In the **Cell** tab, pick cell attributes from the **Available attributes** list and move them to the list of **Selected attributes** by using the **Include >** button.

   In the example below the LTE cell parameters **description** and **numOfTxAntennas** are selected, and the attributes in

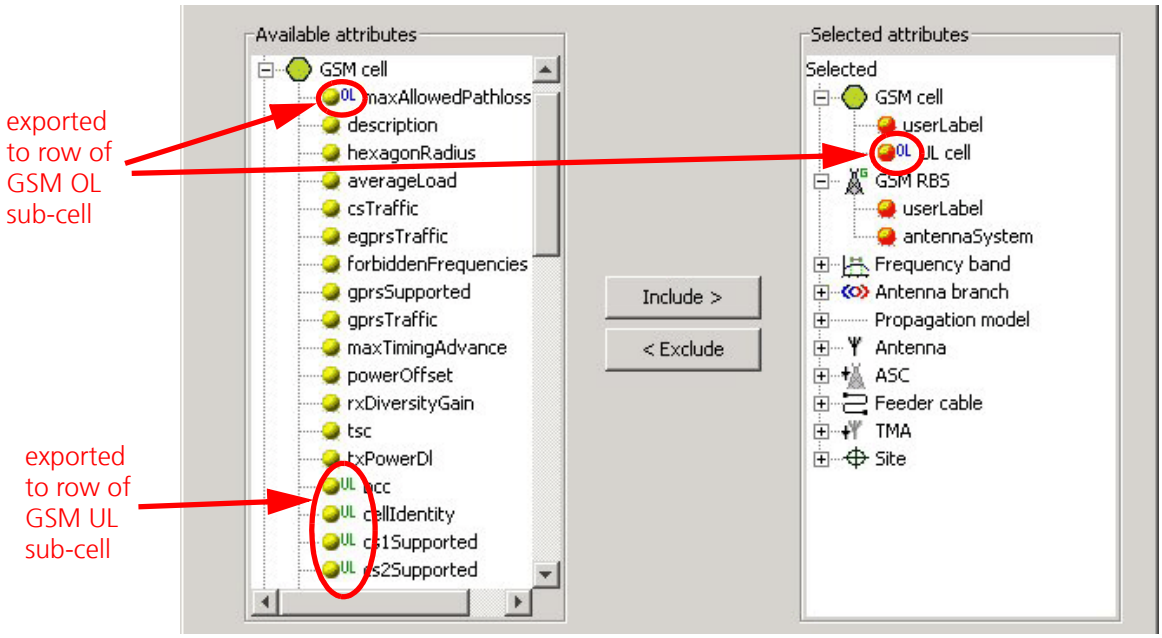
Selected attributes will be exported:



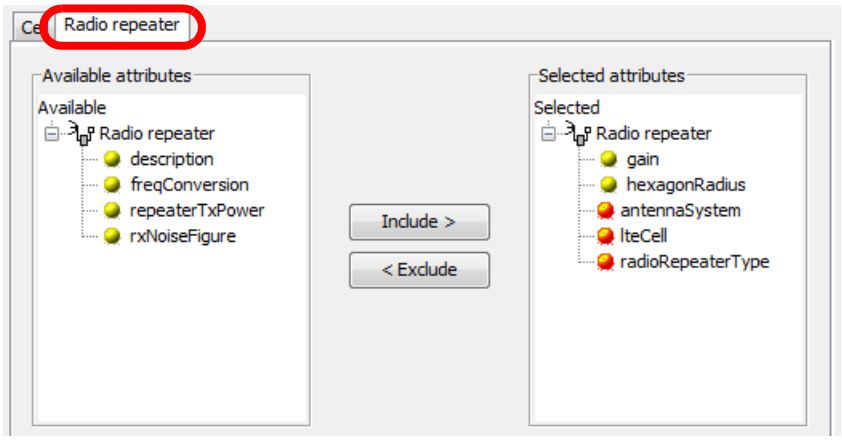
optional attributes, can be manually selected for export (yellow icons)

mandatory attributes, always exported (red icons)

The figure below illustrates GSM overlaid (OL) and underlaid (UL) cell attributes:



7. To export more than mandatory radio repeater attributes, select the **Radio repeater** tab and pick attributes in the same way as in previous step. In the following example the attributes **gain** and **hexagonRadius** are selected:



8. Select a target file name for the export. **.txt** or **.xls** are recommended file extensions, but you can enter any extension suitable for text files.
9. Click **Export**. The selected objects and attributes are written to the file.

Fields on Window “Cell export”

Select cells	The method to select the cells for export: • Select cells individually • Select cells using a filter
Select technology	Technology for which the cell data is exported, either of: • GSM • WCDMA • LTE
Select coordinate presentation	The geodetic datum and projection for sites and antenna positions in export file. • Local: Coordinate system according to project settings • WGS84 Longitude/Latitude: The base system for which all other reference systems are referred to by datum shift. Its coordinates are always in longitude and latitude. • Other: A list of selectable coordinate systems.
Format	Format of the coordinates. • East/North: Meters in a Cartesian coordinate reference system, unavailable for WGS84 • Decimal: Longitude/latitude in degrees with four decimals • DMS: Longitude/latitude in degrees, minutes, seconds and two decimal seconds.
Available attributes	Exportable network element (object) attributes in the project, color-coded as follows: • Yellow icon: Optionally Exported Attributes • Red icon: Mandatory Attributes for Export or Conditionally Exported Attributes • UL tagged icon: Attribute relevant only for GSM underlaid sub-cell where the GSM cell is a dual-band cell • OL tagged icon: Attribute relevant only for GSM overlaid sub-cells where the GSM cell is a dual-band cell
Include	Selects attributes for export.
Exclude	Unselects attributes for export.
Selected attributes	Lists all attributes selected for export.
Comment	Optional text for the header section in the export file.
Export file	Name of the target file for the export.
View details	Displays errors and warnings from the export process.
Export	Starts the export.

Examples of Cells Text Files

The figures below exemplify some cells text files. See also Cells Text File Format on page 19-29.

Figure 19–1 Radio repeaters.

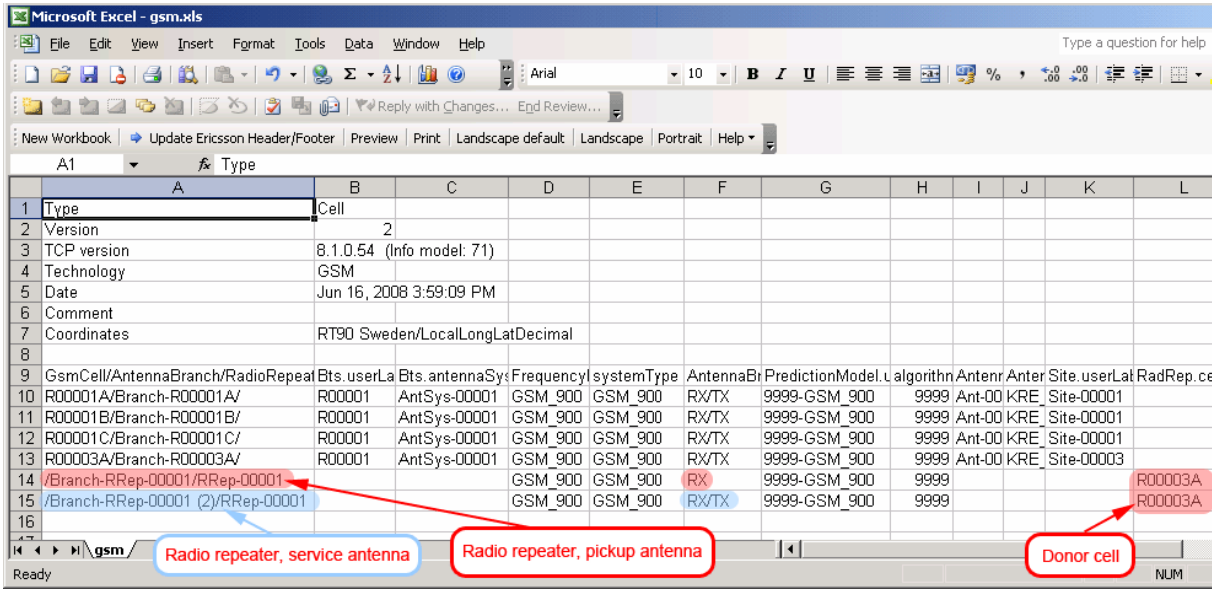


Figure 19–2 GSM cell with multiple antenna branches

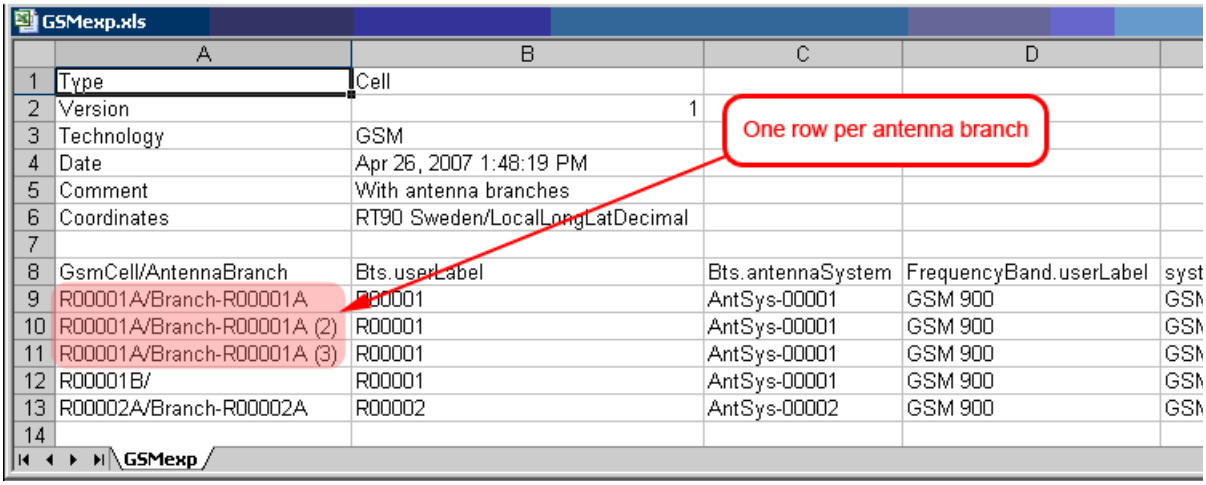
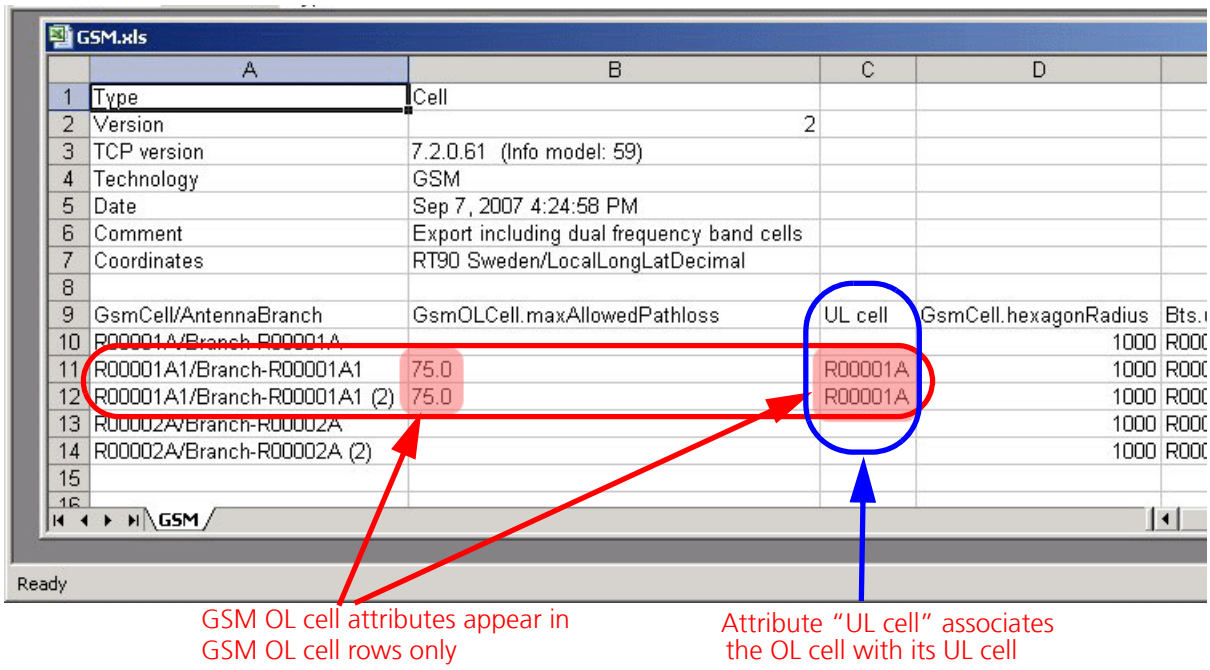


Figure 19–3 GSM overlaid (OL) and underlaid (UL) cells


GSM.xls
Ready
GSM OL cell attributes appear in GSM OL cell rows only
Attribute "UL cell" associates the OL cell with its UL cell

Cells Text File Format

The export file is tab-separated and suitable for spreadsheet processing.

The file has a Header part, Rows with cell or radio repeater information, a Key Column, and Attribute Columns.

Header

The header includes the following information:

Type	string	export/import file type, always "Cell"
Version	integer	export format version
TCP version	string	version of exporting TEMS CellPlanner Client
Technology	string	GSM, WCDMA or LTE
Date	string	file creation date and time
Comment	string	any text without newline
Coordinates	string	site position coordinate system and display format

Rows

There is one row per antenna branch, belonging to any of the following objects:

- Cell

- GSM overlaid (OL) sub-cell of a **dual-band** GSM cell
  Exported to a separate row as the overlaid and underlaid sub-cells use different frequency bands, thus different antenna branches.

  Note: *A GSM overlaid cell of a **single-band** GSM cell is exported to the **same** row as its underlaid cell, since the OL/UL sub-cells use the same frequency band, thus also the same antenna branch.*

- Radio repeater with pickup (rx) antenna
- Radio repeater with service (rx/tx) antenna

There are always two rows for each exported dual-band GSM cell - one for the OL cell/antenna branch, one for the UL cell/antenna branch. GSM OL sub-cell attributes are left blank in GSM UL sub-cell rows, and vice versa.

There are always two rows for each exported radio repeater - one for the pickup antenna branch and one for the service antenna branch. Radio repeater rows appear last in the file.

Key Column

Column 1 holds a **key** identifying the cell or the radio repeater in the row.

Syntax: *pos1/pos2/pos3*, with *pos1*, *pos2* and *pos3* conditionally present

		present in key for cells	radio repeaters
pos1	= cell name	yes	no
pos2	= antenna branch name	if selected for export	yes
pos3	= radio repeater name	no	yes

Examples:

Cell:	RBS-00002B1/Branch-RBS-00002B/
Radio repeater:	/Branch-RRep-Repeater1-Pickup/RRep-Repeater1

Attribute Columns

Columns 2, 3,... contain one attribute each. Attributes of defined objects in the project can be exported. The attributes are categorized as Mandatory Attributes for Export, Conditionally Exported Attributes, and Optionally Exported Attributes.

Mandatory Attributes for Export

The following attributes are always exported together with the object. The frequency band, system type, propagation model, and algorithm name are always the last attributes in the export file, and required when importing the file.

		Exported for			
Object	Attribute	GSM	WCDMA	LTE	Radio repeater
GsmCell	userLabel	X			
Bts	userLabel	X			
	antennaSystem	X			
UtranCell	userLabel		X		
	frequency		X		
Sector	userLabel		X		
Rbs	userLabel		X		
	antennaSystem		X		
LteCell	userLabel			X	
	lteRadioChannel			X	
LteSector	userLabel			X	
LteRbs	userLabel			X	
	antennaSystem			X	
RadioRepeater	userLabel				X
	radioRepeaterType				X
	antennaSystem				X
DonorCell	userLabel				X
FrequencyBand	userLabel	X	X	X	X
	systemType	X	X	X	X
AntennaBranch	userLabel	X	X	X	X
	branchType	X	X	X	X
PropagationModel	userLabel	X	X	X	X
	algorithmName	X	X	X	X
Antenna	userLabel	X	X	X	X
	antennaType	X	X	X	X
Site	userLabel	X	X	X	X
	position	X	X	X	X

Conditionally Exported Attributes

The following are exported under certain conditions, even if not manually selected.

		Exported for			
Object	Attribute	GSM	WCDMA	LTE	Radio repeater
GsmOLCell	userLabel	exported for dual-band GSM cells			
	ULCell				

ASC	userLabel	exported if any other Asc attribute is selected for export
	ascType	
FeederCable	userLabel	exported if any other FeederCable attribute is selected for export
	feederType	
Tma	userLabel	exported if any other Tma attribute is selected for export
	tmaType	

Optionally Exported Attributes

The following attributes are exported with the object only if manually selected. The "*" in the table stands for all attributes except for Mandatory Attributes for Export.

	Exported for			
Object	GSM	WCDMA	LTE	Radio repeater
GsmCell	*			
GsmOLCell	exported for dual-band GSM cells			
Bts	*			
UtranCell		*		
Sector		*		
Rbs		*		
LteCell			*	
LteSector			*	
LteRbs			*	
AntennaBranch	*	*	*	
Antenna	*	*	*	*
Asc	*	*	*	*
FeederCable	*	*	*	*
Tma	*	*	*	*

Customized Attributes

The attribute *customAttributeValueGroup* is packed into a string of format:

```
Label/Value:Type
```

for each attribute. Attributes are separated with a comma character (,). Comma (,) and slash (/) in names or values are escaped with (\), for example \, \/ \\.

Channel Objects

Composite objects like radio channels (for example pcpich) are packed in one field separated with slash. Example for UtranCell.pcpich: `1.0/31.0/256`.

Calculated Attributes

The attributes EiRP and ERP are calculated from the attribute txPowerType:

```
EIRP (dBm) = cell_power + antenna_gain - cable_loss
ERP = EIRP - 2.15
```

Other Text Files

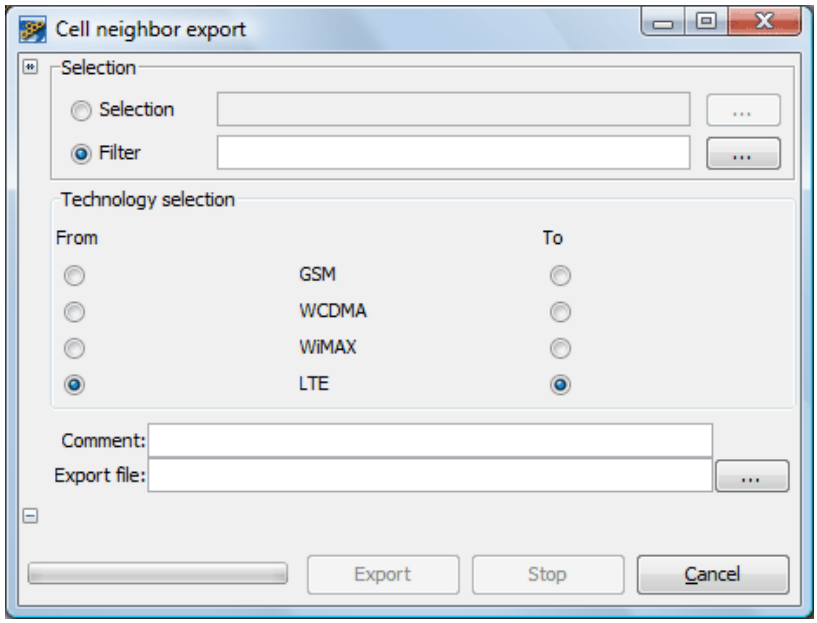
Besides cell and radio repeater information exported to Cells Text Files you can also export the following information to text files:

- cell neighbors, see Export Cell Neighbors Text File
- GSM carriers, see Export GSM Carriers to Text File
- generic information, see Export Generic Text File
- custom attributes, see Export Custom Attributes

Export Cell Neighbors Text File

Do as follows to export cell neighbor relations data to a text file.

1. Select **File↗Export↗Cell neighbors text file** to display the **Cell neighbor export** window.



2. Select the technologies to export data from and to.
3. Specify a directory and file name for export.
4. Click **Export** to start the export process and store the data in the file.

Fields on Window "Cell neighbor export"

From	Technology from which to export neighbor relations
To	Technology to which to export neighbor relations
Comment	Comment to further identify the export file.
Export file	File name of the file for the export results.
Export	Starts the export process.

Cell Neighbors Export File Format

The export file is tab separated and can be post-processed in a spreadsheet application.

The export file is organized in a header section followed by one row for each neighbor relation.

Each column in the export file represents a specific type of information. Each column has a title with tags representing an attribute or relation in the TEMS CellPlanner information model.

At export you can select the technologies to export. Relations from and to cells of a non-selected technology do not appear in the export file, nor do the columns for data specific to a non-selected technology. The export file does not have a fixed format and you can select the columns to include.

Header

The header contains the following pairs followed by one row with column titles.

Tag	Tag content
Type	Neighbor
Version	1
Date	A string representing date and time when the file was created
Comment	A string created at the time of the export

The column title contains tags representing names of attributes and relations in the TEMS CellPlanner information model.

Data

The data content depends on the combination of from- and to-technologies.

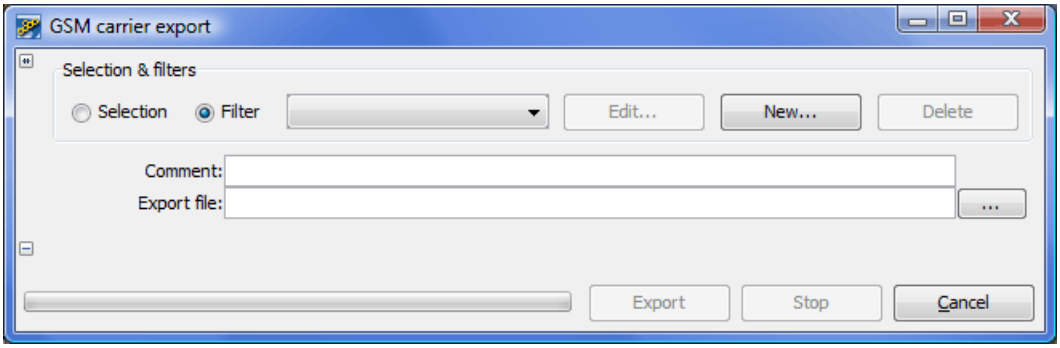
The left column identifies the neighbor relation belonging to a cell of the "from technology" (GSM cell, UTRAN cell, WiMAX cell or LTE cell) and the user label of the to-technology neighbor relation (GSM relation, UTRAN relation, WiMAX relation or LTE relation).

The remaining columns represent attributes and relations of the "to technology" neighbor class (GSM relation, UTRAN relation, WiMAX relation or LTE relation).

Export GSM Carriers to Text File

Use this procedure to export GSM carrier data to a text file, see file format description in GSM Carrier Export File Format on page 19-36.

1. Select **File↗Export↗GSM carriers text file**:



2. Browse to desired folder and enter a target file name.
3. Click **Export** to export the carrier data.

Fields on Window "GSM carrier export"

Comment	Comment to further identify the export file.
Export file	File name of the file for the export results.
Export	Starts the export process.

GSM Carrier Export File Format

File Header Information

The first five lines of the carrier file contain data such as type of data, version of the format, technology, date and time, and comments.

Type	**Carrier**
Version	1
Technology	GSM
Date	Date and time when file was created.
Comment	Comment text

Column Titles

The first line of column title data contains identifying information.

Subsequent lines contain the channel group, TRX, Frequency Group and Available Carrier data as attribute and relations:

Column Title	Value One Row
GsmCell.userLabel/ GsmOLCell.userLabel/ ChannelGroup.groupNumber/Trx.position or Bts.userLabel/GsmCell.userLabel/GsmOLCell.userLabel/ ChannelGroup.groupNumber/Trx.position or GsmCell.cellIdentity/GsmOLCell.userLabel/ ChannelGroup.groupNumber/Trx.position	Site0B//0/0 Site0/Site0B//1/0 1//1/0
ChannelGroup.hop	ONSY
hsn	31
maioList	
numOfTimeslotEgprs	0
numOfTimeslotGprsCs3Cs4	0
Trx.cs3Cs4Capable	0
edgeCapable	0
isBcch	0
isLocked	0
carrier	90
frequencyGroup	BCCH_B2
FrequencyGroup.carriers	102,111,120

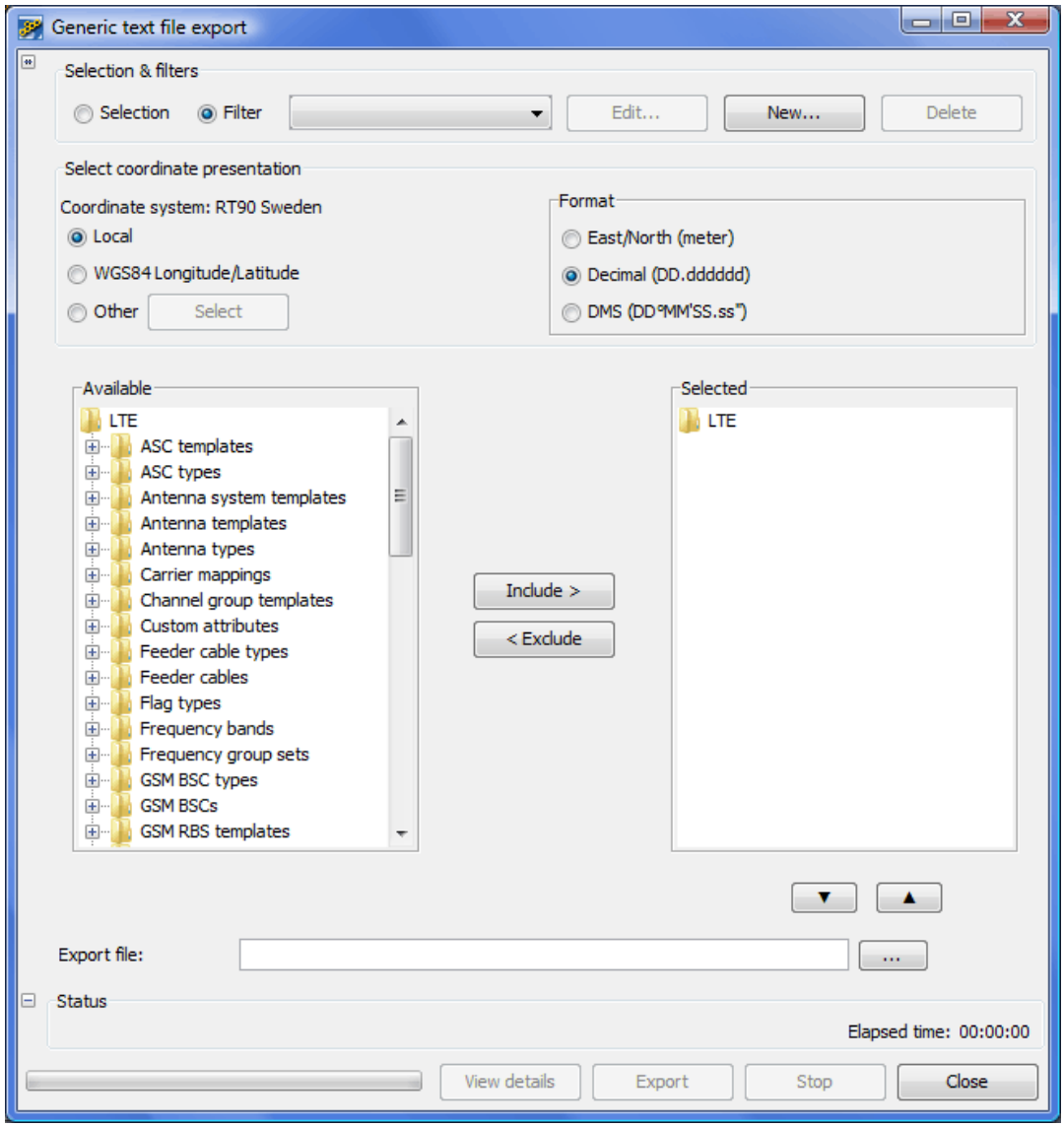
Export Generic Text File

Use the generic export function to export network elements and other objects such as templates and systems used in a network plan. The exported data results in a tab delimited ASCII file in which every row contains the same number of columns. The first row in the file specifies the data contained in each column.

For more information on generic text files, see Details on Generic Text File Import/ Export on page 18-41.

Do as follows to export project data to a generic text file:

1. Select **File↗Export↗Generic text file**. The **Generic text file export** window is displayed. The **Available** column displays a list of available network elements and other objects in the project.



2. Click **Include** to move the selected object to the **Selected list**.
3. Optional step: Place attributes in desired order in the **Selected** list by using the arrow buttons.
4. Browse to the target folder and enter a target file name.
5. Click **Export**. The selected objects are stored in the file specified.
6. Optional: Click **View details**. The **View details** window is displayed showing the results of the export process.

Fields on Window "Generic text file export"

Available	Lists all network elements and other objects (templates, services…) owned by either the project.
Include	Specifies objects to include from the **Available** list.
Exclude	Specifies objects to exclude from the **Available** list.
Selected	Lists all objects included for the export.
(move up)	Arrow moves the attributes (but not their relations) up one step at a time. Attribute(s) may also be excluded from the export.
(move down)	Arrow moves the attributes (but not their relations) down one step at a time. Attribute(s) may also be excluded from the export.
Export file	Name of the file to use for results of the export process.

Example Generic Text Export File

The file contains rows with values separated by "/", as in this example:

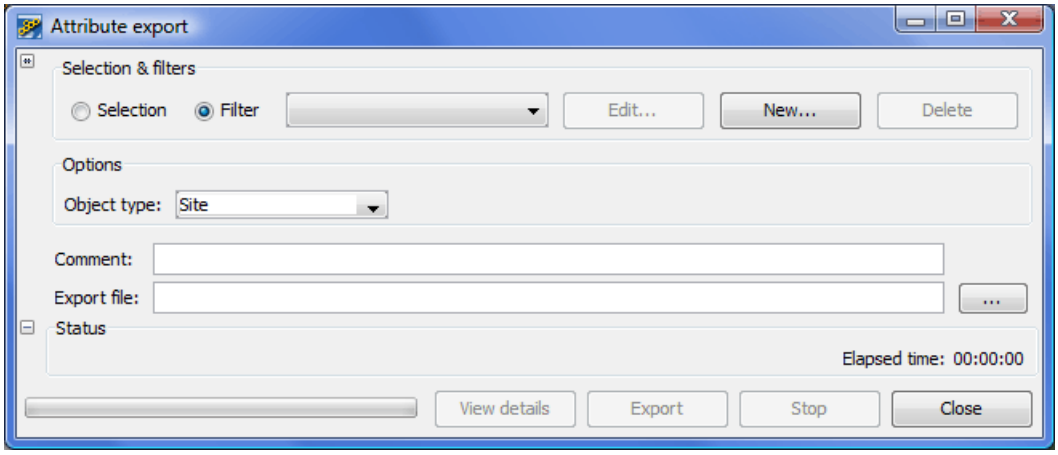
```
CoordinatesRT90 Sweden/Local Longitude and Latitude, decimal
Site.position/LteRbs.userLabel/LteSector.userLabel/AntennaBranch.userLabel
17.93604628356255,59.414235021750414/RBS-00001/RBS-00001A/Branch-RBS-00001A
17.93604628356255,59.414235021750414/RBS-00001/RBS-00001B/Branch-RBS-00001B
17.93604628356255,59.414235021750414/RBS-00001/RBS-00001C/Branch-RBS-00001C
17.928196852072947,59.39186208384066/RBS-00002/RBS-00002A/Branch-RBS-00002A
17.928196852072947,59.39186208384066/RBS-00002/RBS-00002B/Branch-RBS-00002B
17.928196852072947,59.39186208384066/RBS-00002/RBS-00002C/Branch-RBS-00002C
17.97367706323621,59.40251943537687/RBS-00003/RBS-00003A/Branch-RBS-00003A
17.97367706323621,59.40251943537687/RBS-00003/RBS-00003B/Branch-RBS-00003B
17.97367706323621,59.40251943537687/RBS-00003/RBS-00003C/Branch-RBS-00003C
17.973239146021598,59.37806730490034/RBS-00004/RBS-00004A/Branch-RBS-00004A
17.973239146021598,59.37806730490034/RBS-00004/RBS-00004B/Branch-RBS-00004B
17.973239146021598,59.37806730490034/RBS-00004/RBS-00004C/Branch-RBS-00004C
```

Export Custom Attributes

Custom attributes are extra information applied to sites, RBSs and cells.

Do as follows to export custom attributes:

1. Select **File↗Export↗Attribute text file**. The **Attribute export** window is displayed:



2. Browse to the target folder and enter a target file name.
3. Click **Export** to start the export process and store the data in the file.

Fields on Window "Attribute export"

Object type	The object type for which to export custom attributes. You can only select one type at a time. Selectable types include Site, RBSs of all technologies, and cells of all technologies.
Comment	Optional comment to describe the file.
Export file	The output file name and directory.

Interference Tables

Export Interference Tables

This function is used for GSM networks. Detailed information for exporting interference tables is provided in the *TEMS CellPlanner GSM User's Guide* in the chapter titled "Using Interference Tables".

Subscriber Files

Fixed subscribers are terminals with a fixed position in LTE or WiMAX network plans, see *TEMS CellPlanner LTE User's Guide* and *TEMS CellPlanner WiMAX User's Guide*.

You can export fixed subscribers from your project to process their information in a tab separated text file. TEMS CellPlanner of course allows you to modify properties of fixed subscribers within the tool, but with this feature you can instead view and modify the properties in a text file.

Export Fixed Subscribers

LTE or WiMAX fixed subscribers can be exported together with their sites positions. You can apply a filter on the export to delimit the number of exported sites. You can export the site positions in any coordinate system supported by TEMS CellPlanner.

File Format

The format of the fixed subscriber file is described in the *TEMS CellPlanner Common Features Technical Reference Manual*.

Prerequisites

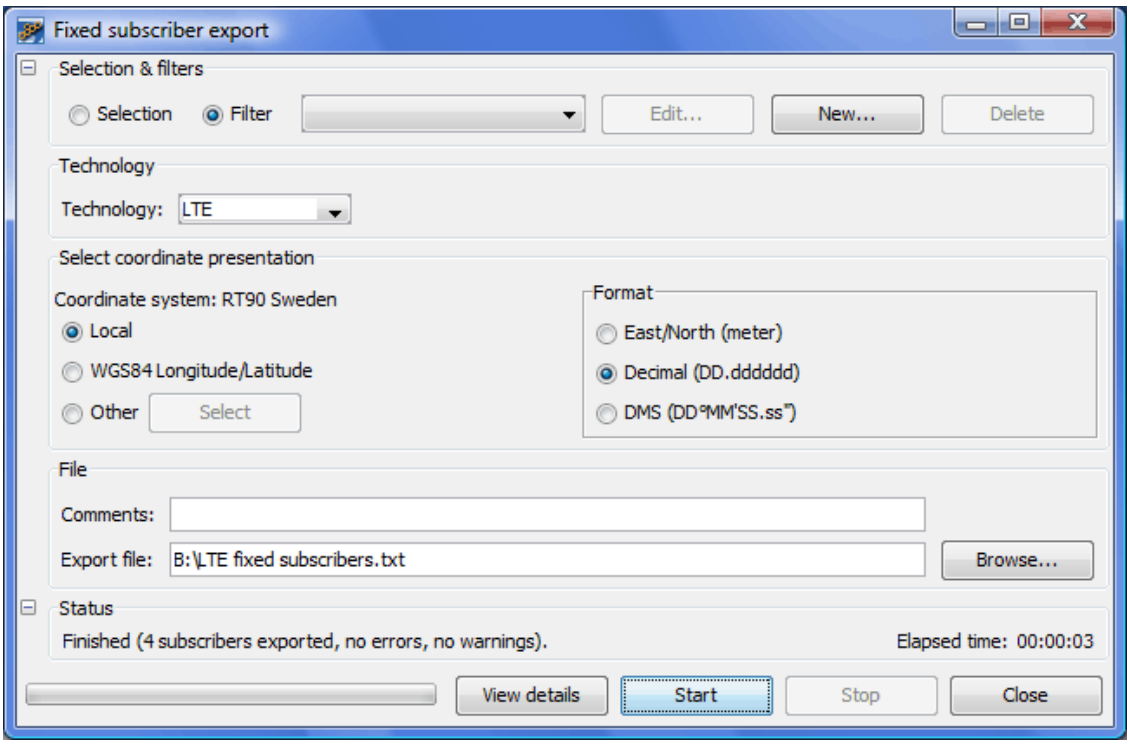
Fixed subscriber sites are defined in an open project.

Procedure

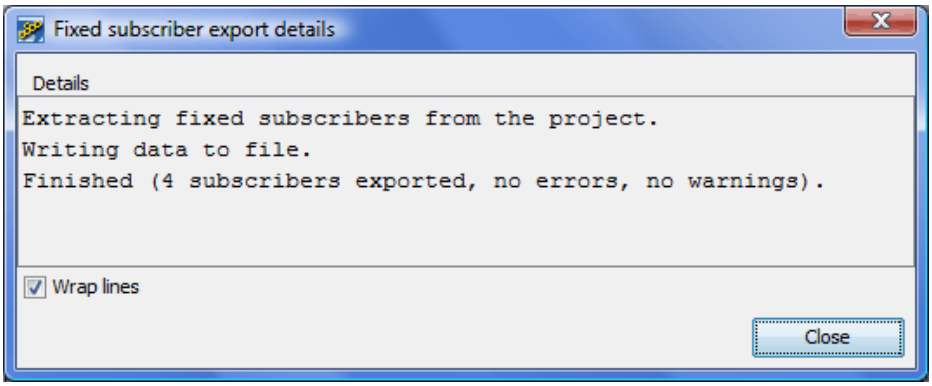
Use this procedure to export fixed subscriber data to a text file.

1. Select File↗Export↗Fixed subscribers text file... The Fixed subscribers export window is displayed.
2. Optionally limit the number of sites to export by defining a selection or filter.
3. Select a coordinate reference system for the exported coordinates of the fixed subscriber sites.
4. Select a format for the exported coordinates.
5. Optionally enter comments identifying the export file.
6. Specify a directory and file name for export.
7. Click Start. The export to the specified file begins and the Status field displays the progress.
8. If the file already exists you are asked to confirm that the file may be overwritten.

9. When the export completes, the Status field tells that the export is Finished, and the **View details** button is enabled. The **Fixed subscriber export** window then looks as in the example below:



10. To check the result of the export, click **View details**. The **Fixed subscriber export details** appears:



Fields on Window "Fixed subscriber export"

Technology	Type of fixed subscriber sites to export, either LTE of WiMAX.
Select coordinate presentation	The coordinate system and format to apply to the fixed subscriber site positions. Coordinate system: • File - select this option (default) if a coordinate system is included in the import file. After the import, the import file's coordinate system is displayed together with this option. • Local • WGS84 Longitude/Latitude • Other - select from list of supported coordinate reference systems in TEMS CellPlanner Format: The coordinate format of the exported fixed subscriber site positions. • East/North (meter) • Decimal (DD.dddddd) • DMS (DD°MM'SS.ss")
Comments	Comments to further identify the export file.
Export file	File name of the file for the export results.
View details	Displays a sequence log of the export.
Start	Starts the export process.
Stop	Stops the export process.
Close	Stops any ongoing export and closes the export window.

Cell Polygons Text File

WCDMA cell polygons can be used to identify the best server cell of an emergency call. Cell polygons of up to 15 vertices may be exported to a tab separated text file viewable in spreadsheet programs like MS Excel or a text editor.

Read more about cell polygons in the *TEMS CellPlanner WCDMA User's Guide*.

Export Cell Polygons

Use this procedure to export generated cell polygons from a WCDMA project to a text file.

Note: *The exported information cannot be imported back into TEMS CellPlanner. The purpose of exporting is simply to get a textual presentation of the polygons.*

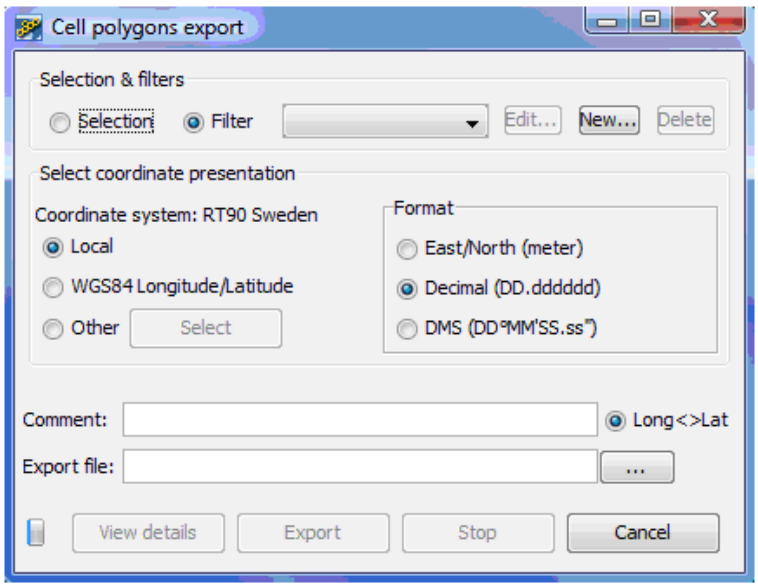
Prerequisites

Cell polygons are created for the project, see *Generate Cell Polygons* in the *TEMS CellPlanner WCDMA User's Guide*.

Procedure

Do as follows to export cell polygons:

1. Select **File↗Export↗Cell polygons text file...** The Cell polygons export window is displayed as in the following example:



2. By default, the same filter (or selection) used during generation of the polygons is applied in this window as well. Optionally select another filter (or selection).
3. Select coordinate system and format of coordinates.
4. Toggle the **Long<>Lat** option to select which of the coordinates of a position that will be written first into the export file.
5. Optionally enter a comment.
6. Enter or browse a file name. You may overwrite existing files.
7. Click **Export**. The cell polygons are written to the export file.

Format and Examples of Cell Polygons Text File

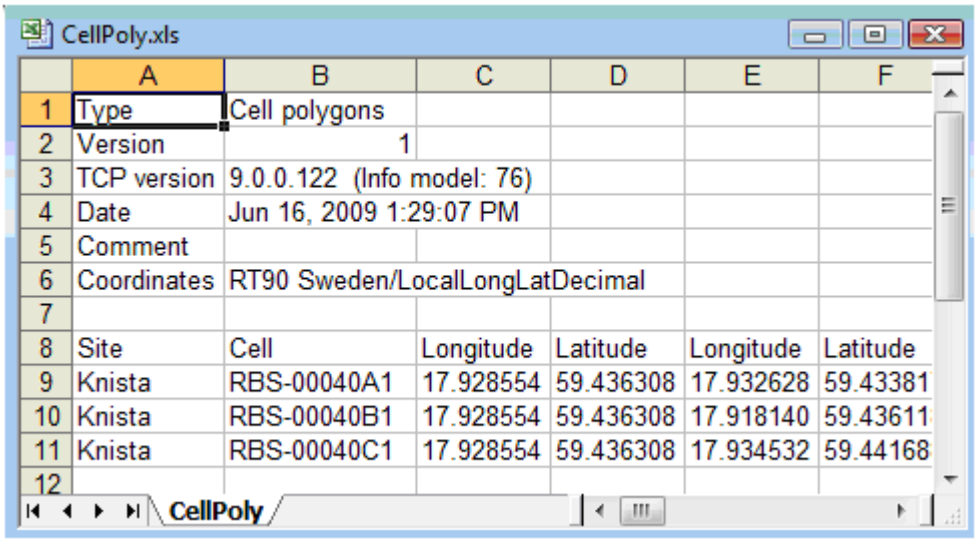
The cell polygons text file contains tab separated fields with the following information:

- A header field of 6 rows and 2 columns, see details below
- One row with 6 column headers
- Data rows: One row per cell polygon, each row contains 2*n columns where n = number of vertices (max 15)
  - site name
  - cell name
  - position of vertex 1 (2 columns; longitude and latitude in selected order)
  - ...
  - position of vertex n(2 columns; longitude and latitude in selected order)

The **header** consists of 6 rows in 2 columns with the following information:

Type	"Cell polygons"
Version	An integer denoting version starting with 1
TCP version	5 integers denoting the version of theTEMS CellPlanner version, including information model version, from which the file was created
Date	Date and time when the export file was created, in format defined from the Control Panel
Comment	Any text without newline
Coordinates	Coordinate system and coordinate format of exported sites

Figure 19–4 Cell polygons export file, default layout

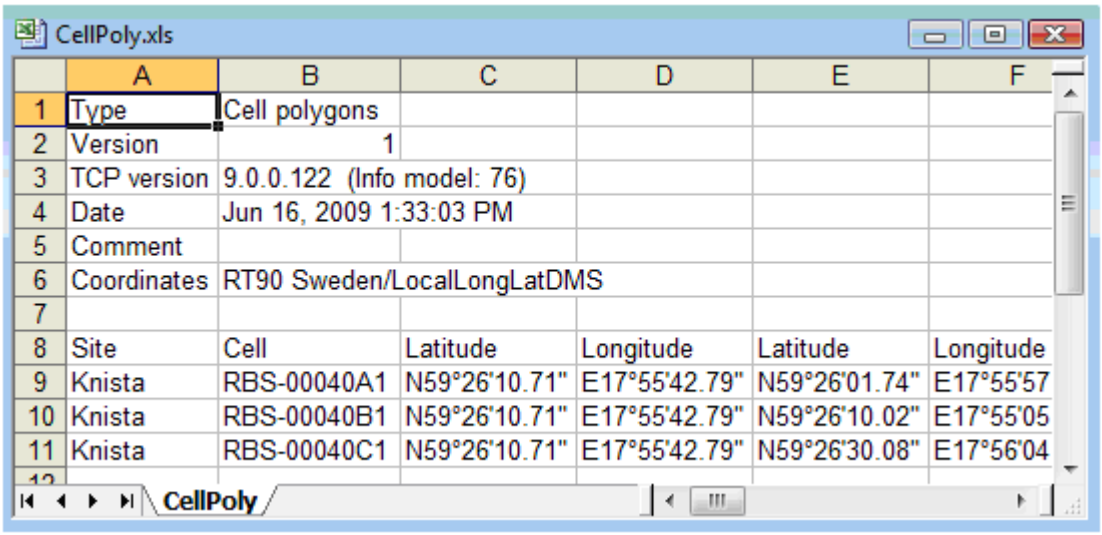


CellPoly.xls

	A	B	C	D	E	F
1	Type	Cell polygons				
2	Version	1				
3	TCP version	9.0.0.122 (Info model: 76)				
4	Date	Jun 16, 2009 1:29:07 PM				
5	Comment					
6	Coordinates	RT90 Sweden/LocalLongLatDecimal				
7						
8	Site	Cell	Longitude	Latitude	Longitude	Latitude
9	Knista	RBS-00040A1	17.928554	59.436308	17.932628	59.43381
10	Knista	RBS-00040B1	17.928554	59.436308	17.918140	59.43611
11	Knista	RBS-00040C1	17.928554	59.436308	17.934532	59.44168
12						

CellPoly

Figure 19–5 Cell polygons export file with altered coordinates and DMS format



CellPoly.xls

	A	B	C	D	E	F
1	Type	Cell polygons				
2	Version	1				
3	TCP version	9.0.0.122 (Info model: 76)				
4	Date	Jun 16, 2009 1:33:03 PM				
5	Comment					
6	Coordinates	RT90 Sweden/LocalLongLatDMS				
7						
8	Site	Cell	Latitude	Longitude	Latitude	Longitude
9	Knista	RBS-00040A1	N59°26'10.71"	E17°55'42.79"	N59°26'01.74"	E17°55'57
10	Knista	RBS-00040B1	N59°26'10.71"	E17°55'42.79"	N59°26'10.02"	E17°55'05
11	Knista	RBS-00040C1	N59°26'10.71"	E17°55'42.79"	N59°26'30.08"	E17°56'04

CellPoly

20
Script Console

The script utility enables a TEMS CellPlanner user to perform complex customized operations from the **Utilities** menu.

The script support is based on Jython, a variant of Python supporting Java. Before using the script console, you must learn the basics of Python.

Scripts can access and modify a network configuration loaded into the client. Most dialogs in the tool can also be controlled by scripts. Scripts can be executed automatically at startup of a client.

Examples of script usage:

- Conditional modification of attributes
- Advanced search
- Specialized reports
- Specialized imports
- Sophisticated object renaming operations

When you install TEMS CellPlanner, a number of pre-defined scripts are installed in

```
C:\Program Files\Ascom\TEMS Products\<product
version>\Scriptlib
```

Read more in **Help↗Manuals↗Script Support.**

Glossary

3GPP

3rd Generation Partnership Project

16 QAM

16-symbol Quadrature Amplitude Modulation

9999 propagation model

An RF propagation model for macrocells based on the Okumura-Hata model.

1x2 MRC

See MRC. The same signal is received by two antennas, and the best signal is chosen in every rx instance.

ACP

Automatic Cell Planning. A licensed TEMS CellPlanner feature for optimizing WCDMA cell plans and presenting the optimization costs.

Active Set

The set of radio links simultaneously involved in a specific communication service between a WCDMA system and particular user equipment.

activity factor

Factor indicating the percentage of time a channel is used. For example, a channel with an activity factor of 0.1 is used 10% of the time.

A-DCH

Associated Dedicated Channel used for HSDPA UL signaling

adjacent cell

Cell with a radio coverage area that overlaps with the radio coverage area of another cell.

adjacent channel

A radio channel either one channel space above or below the reference channel.

AF

See activity factor.

AFP

Automatic Frequency Planning. A licensed TEMS CellPlanner feature for optimizing GSM frequency plans with fixed frequency or baseband hopping, and presenting the optimization costs.

AGL

Above Ground Level

AICH

Acquisition Indication Channel. WCDMA downlink physical channel. Acknowledges that the UTRAN has received a user equipment random access attempt.

AMI

Automatic Measurement Integration. A licensed TEMS CellPlanner feature removing antenna dependency from measured pathloss. The result is stored for later use by ASMT or to replace predicted pathloss with measured pathloss.

AMR

Adaptive Multi Rate speech modeled in TEMS CellPlanner using WCDMA bearers.

AMSL

Above Mean Sea Level

antenna branch

Models an RF path through the equipment selected from the antenna system. Contains an antenna, and DL and UL losses/gains.

antenna branch type

The antenna branch may one be of three kinds:

- RX, receiving branch
- TX, transmitting branch
- RX/TX, duplex branch transmitting and receiving

antenna gain (dBi or dBd)

Maximum gain of the receiver or transmitter antenna in the horizontal plane (specified as dB relative to an isotropic radiator or dipole).

antenna system

Groups antenna equipment to be connected by the antenna branches. Several antenna branches can share the same radio equipment.

ARFCN

Absolute Radio Frequency Channel Number - channel number in GSM.

ARQ

Automatic Repeat Request

ASC

Antenna System Controller, used in WCDMA networks. Provides approximately the same functionality as a TMA.

ASE

Air-interface Speech Equivalent used by Admission Control in Ericsson's WCDMA systems.

ASMT

Automatic Sector Model Tuning. Generates sector specific propagation models using AMI data with enough measured values from the sectors.

azimuth

Antenna direction calculated clockwise relative to true North.

base station

The radio equipment and antennas located at a site. The base station can have one or more cells.

base to first screen distance

Ericsson Urban propagation model parameter. Determines the distance between the base antenna and the first screen in the half-screen model.

baseband hopping

A method to achieve frequency hopping connections in GSM when every transceiver has a fixed transmission frequency. A connection hops by switching between the transceivers, which means that the number of hopping frequencies equals the number of transceivers.

basic ranking

A method used to find the best server of a GSM mobile, taking only signal strength into account. Used for fast-moving mobiles.

BCC

Base station color code used in GSM systems.

BCCH

Broadcast Control CHannel, the logical channel in GSM, transmitted on "carrier zero".

BCH

Broadcast Channel. WCDMA downlink transport channel. Continuously transmits system and cell specific information.

bearer

A service type in radio systems, such as speech and packet data plus the one or two frequency bands that can be used.

BER

Bit Error Rate

best server

The cell that serves a bin, different for different kinds of traffic cases. From a modeling point of view, the best server is the cell with the lowest pathloss to the bin.

bin

In cell planning, a bin is the basic unit of an analysis area or a plot area in the display of TEMS CellPlanner. A bin is the smallest unit (also called pixel) for which cell planning can be done. You can define your own bin size, but usually the bin size is defined in relation to the map data resolution, for example, 5 x 5 meters or 20 x 20 meters. Analysis is run on a per-bin basis for an entire network, and plots are also provided on a per-bin basis.

bit rate shaping

In scheduling of LTE bearers, a terminal shall not be assigned a higher bitrate than subscribed to.

BSC

Base Station Controller in GSM systems.

BSIC

Base Station Identity Code used in GSM systems. Consists of two parts: NCC and BCC.

BSS

Base Station subsystem used in 2G mobile communications.

BTS

Base Transceiver Station. Base station in GSM terminology. See RBS.

building penetration slope

Ericsson Urban propagation model parameter. The value for the rate at which the signal decreases inside a building.

Bulk CM

Bulk Configuration Management. OSS-RC Interface for large scale import/export of WCDMA cell configuration data. Bulk CM files follow a 3GPP-compliant XML file format. TEMS CellPlanner supports import and export of Bulk CM files from/ to OSS-RC.

carrier layer

A set of GSM frequencies used for either BCCH or TCH. The BCCH and TCH layers may overlap. In a dual-band network, different carrier layers are defined for each frequency band.

carrier zero

The frequency on which the GSM broadcast control channel (BCCH) is transmitted.

cell

The radio equipment and antennas at a base station that serve user equipment in all azimuth angles (omni cell) or within an angle interval (sector cell). The term is also used for the geographic area served by one cell. A cell contains one or more antenna branches. A WCDMA cell has one radio carrier. A GSM cell has one BCCH carrier and zero or more TCH carriers.

CGI

Cell Global Identity, used in GSM networks.

channel

One of the set of channels transmitted between the base station and the user equipment within a given WCDMA frequency assignment.

channel assignment

A WiMAX carrier number representing a DL and an UL frequency (in FDD mode) or a radio frequency used in DL and UL (in TDD mode).

channel element

The required baseband processing capacity and hardware.

channel group

A number of frequencies assigned to transceivers.

channel number

A number corresponding to the assigned EARFCN (LTE), UARFCN, (WCDMA) or ARFCN (GSM).

channelization codes

Also called orthogonal variable spreading factor codes (OVSF codes). Used to separate transmissions from the same transmitter on communication channels (common channels and traffic channels). Provided that individual transmitters are assigned different scrambling codes, the channelization codes (256 in total) can be re-used in each of the transmitters as is done in WCDMA. Each cell gets its own scrambling code, but the channelization codes used in each of these cells are the same.

chip rate

The chip rate of the air interface defines the noise bandwidth of the WCDMA radio channel. A chip rate of one kcps (Kilo Chip Per Second) corresponds to a noise bandwidth of one kHz (Kilo Hertz).

C/I

Carrier to interference ratio. The mobile identifies the signal from the best server as the carrier. It then tunes to that frequency and demodulates the signal to get a connection. All other signals in the

same carrier frequency are interference. C/I is the ratio of the carrier to the interference.

C/(I+N)

Carrier to Interference-plus-Noise ratio.

C/Ia

Carrier to adjacent channel interference ratio, calculated with the adjacent channel attenuation taken into account

C/Ic

Carrier to co-channel interference ratio

C/(Ic+Ia)

Carrier to co-channel plus adjacent channel interference ratio, calculated with the adjacent channel attenuation taken into account.

CID

TEMS CellPlanner synonym for PCI in LTE networks.

CID group

TEMS CellPlanner synonym for PCIG in LTE networks.

clutter

Different area types are classified as clutters in a digital map. Synonym to land use.

clutter factor

Propagation model parameter. Defines an extra loss or gain due to effects in a near environment of the mobile station.

clutter height

Ericsson Urban propagation model parameter. The height of the screens associated with this a specific clutter type.

clutter separation

Ericsson Urban propagation model parameter. The distance between the screens.

CNA

Cellular Network Administration.Part of OSS-RC used for configuration of GSM networks.

CNAI

CNA Interface. OSS-RC interface for import/export of GSM cell configuration data. TEMS CellPlanner supports import and export of CNAI files to/from OSS-RC.

composite

For all cells, see CPLM. Composite plots displays the combined result for all LTE, WCDMA, or WiMAX cells.

connection

A communication channel between two or more end-points in any radio network. A GSM connection is a fixed frequency, or an FH channel group, used by the best server of the current bin.

coordinate reference system

The selection of geodetic datum, ellipsoid, and map projection (including its parameters) all together.

CPICH

Common Pilot Channel, the WCDMA downlink channel carrying a pre-defined symbol sequence,

used as a phase and timing reference for other channels in the same cell.

CPLM

Composite Path Loss Matrix contains pathloss prediction results for all LTE, WCDMA, or WiMAX cells in a TEMS CellPlanner project.

CQI

Channel Quality Indicator in WCDMA networks.

cross polar discrimination

The relative attenuation of a signal with a polarization orthogonal to the antenna polarization plane compared to a signal in the antenna polarization plane.

CS

Circuit Switched. The connection type used for speech in GSM and WCDMA networks and high speed circuit switched data (HSCSD) in GSM networks. May also carry WCDMA streaming data. See *PS*.

CS-3/CS-4

Coding Schemes 3 and 4, used to increase the data rate for GPRS.

CW

Continuous Wave

dB

Abbreviation for decibel, a measure of a relation between two parameters.

dBd

A measure of power in decibels that includes gains relative to a dipole antenna.

dBi

A measure of power in decibels that includes gains relative to an isotropic antenna.

dBm

A measure of power expressed in terms of its ratio (in dB) to one milliwatt. (dBm) = 10 $\log_{10}$ (watts) + 30.

DCH

Dedicated Channel, the traffic channel in WCDMA networks.

diversity gain

Obtained using spatial or polarization diversity techniques for transmitter and/or receiver antennas.

DL

See downlink.

downlink

The radio channel (forward channel) used to transport user and signaling traffic from the base station to the user equipment.

DPDCH

In TEMS CellPlanner, denotes a Dedicated Packet Data channel in a GSM network.

DTX

Discontinuous transmission.

Dual-band cell

An underlaid/overlaid cell pair where the overlaid sub-cell uses another frequency band than its underlaid sub-cell.

EARFCN

E-UTRA Absolute Radio Frequency Channel Number in LTE.

E_b/I_o

The energy of an information bit in the uplink or downlink traffic channel compared to the total power spectral density in the received bandwidth (I_O).

E_c/I_o

The ratio in dB between the pilot energy accumulated over one PN chip period (E_c) to the total power spectral density in the received bandwidth (I_O). Same as E_O/N_O, but does not include the self-interference.

E_o/N_o

The ratio of the pilot's received signal code power (RSCP) to the total downlink power (RSSI). Same as E_c/I_O but includes also the self-interference.

E-AGCH

E-DCH Absolute Grant Channel, used in EUL capable WCDMA networks.

ECSD

Enhanced Circuit Switched Data (High Speed Circuit Switched Data with Enhanced Data Rates for Global Evolution (EDGE), used in GSM networks. Not supported by TEMS CellPlanner.

E-DCH

Enhanced Dedicated Channel, used in EUL capable WCDMA networks.

EDGE

Enhanced Data Rates for Global Evolution (used with GPRS), used in GSM networks.

effective earth radius

The earth radius as experienced by the RF prediction. The effective earth radius (km) = K * Earth radius (6370 km), where K normally is denoted K factor.

effective radiated power (ERP)

The transmitted power multiplied by the antenna gain referenced to a half-wave dipole.

effective street width limit

Ericsson Urban propagation model parameter that takes into consideration the effects of knife-edge diffraction. It defines the minimum distance between the screen and mobile.

EGPRS

Enhanced General Packet Radio Service (GPRS), used in GSM networks.

E-HICH

E-DCH HARQ Acknowledgement Indicator Channel, used in EUL capable WCDMA networks.

EIRP

Effective Isotropic Radiated Power. The transmitted power multiplied by the antenna gain referenced to an idealized isotropic antenna.

ellipsoid

A rotational ellipsoid is used to describe the shape of the Earth. The ellipsoid is defined using its major and minor axes. An ellipsoid must be defined together with a map projection since a map projection describes the relationship between grid coordinates (such as in meters) and geographical longitude and latitude coordinates

external cell

A neighbor cell that does not belong to the system selected as the From technology or system in the neighbor list window of TEMS CellPlanner.

(degrees) on the given ellipsoid.

eNodeB

Evolved Node B, the LTE base station. See RBS.

Equivalent Telephony Erlang

Comparative measure of traffic that does not refer to a particular service type, such as voice or data.

E-RGCH

E-DCH Relative Grant Channel, used in EUL capable WCDMA networks.

EriMap

GIS system for mobile network applications.

Erlang

A unit of measure of the average offered traffic: it is the product of the average rate of new users (users/hour) and the average holding time per user (hours/user). One Erlang is the equivalent of 60 minutes of talk time in one hour.

ERP

Effective Radiated Power. The transmitter power multiplied by the antenna gain referenced to an idealized dipole antenna.

EUL

Enhanced Uplink, also referred to as HSUPA, a capability in WCDMA networks.

exterior area

The part of an LTE cell with geometry values below the geometry threshold. The exterior area is usually far from the eNodeB (LTE RBS). See geometry.

external cell

A neighbor cell that does not belong to the system selected as the From technology or system in the neighbor list window of TEMS CellPlanner.

E-UTRA

Evolved Universal Terrestrial Radio Access

FACH

Forward Access Channel, WCDMA downlink transport channel. Used for transmission of idle-mode control information to the user equipment.

fade margin

Usually expressed in dB, added to the pathloss to ensure a certain coverage probability.

FAS

Frequency Allocation Support in GSM.

FDD

Frequency Division Duplex in WCDMA and WiMAX networks.

FDN

See Fully Distinguished Name.

feeder

A coaxial cable connecting a radio transceiver to an antenna.

feeder coupler

A device for impedance matching between a radio-frequency transmitter and an antenna having an unknown impedance. The feeder coupler may be used to model various equipment, such as multicouplers, combiners, connectors, or 3 dB couplers. Modeled as an extra attenuation in TEMS CellPlanner.

FET

Fixed Electrical Tilt. Standard 0°, 2° and 6°.

FH

Frequency Hopping

filter

In TEMS CellPlanner, a stored selection of objects based on geographical area view, sites, or flags. Multiple filters can be combined in a filter group.

fixed subscriber

A *WiMAX fixed subscriber* is the TEMS CellPlanner model of a non-mobile or nomadic terminal in a WiMAX network, as described in the IEEE 802.16d (2004) standard. A nomadic (semi-mobile) terminal can be connected to different WiMAX cells at different times, but handover during a call is not possible.

flag

In TEMS CellPlanner, a tag that can be assigned to RBSs or cells as a mechanism for sorting them by selected groups.

FLP

Fractional Load Planning. A frequency planning method for a GSM network with synthesizer hopping, in which the number of frequencies assigned to a channel group exceeds its number of transceivers.

forward channel

A radio channel from a base station to mobile stations.

FOX

Frequency Optimization Expert in GSM.

frame

A basic timing interval in a radio network.

frequency band

The frequency band defines the available frequencies to be used in the network. It is defined between the upper and lower channel center frequencies.

frequency diversity gain

See *hopping gain*.

FR

Full Rate, relevant for speech coding in GSM and WCDMA networks.

Fully Distinguished Name (FDN)

Uniquely identifies a Managed Object within OSS-RC. Example of an FDM for a UtranCell: "Subnetwork=Sweden,Subnetwork=RNC5,MeContext=RNC5,ManagedElement=1,RncFunction=1,UtranCell=Stockholm1A".

FUSC

Full Usage of Sub-Carriers in WiMAX networks.

GBR

Guaranteed Bit Rate, a QoS class in LTE bearers.

geodetic datum

A selection of a rotational ellipsoid and its position and orientation in respect to the actual center of the Earth. In TEMS CellPlanner, only the position and orientation parameters are used as the geodetic datum. The ellipsoid is treated separately. The parameters are stored as the change required to transform from a local geodetic datum to the global WGS84 (World Geodetic System 1984) datum. Three or seven parameters can be used (only translations or translations, rotations and scale change).

geometry

The difference (in dB) between the pathloss to the second best server and the pathloss to the best server. The pathloss is calculated from a bin or an NP. The geometry is usually highest close to the eNodeB (LTE RBS).

GeoBox

A map data format

GERAN

GSM-EDGE Radio Access Network

GIS

Geographic Information System

GPRS

General Packet Radio System, the standard for packet switched data in GSM systems.

GPS

Global Positioning System

Grade of Service (GOS)

The percentage of calls allowed to be blocked. This is a performance specification used for circuit switched traffic.

graze wall constant

Ericsson Urban propagation model parameter. The value for the signal penetrating the external wall with a grazing angle.

GSM

Global System for Mobile communication, a world-wide standard for second generation mobile telecommunication networks.

G-RAKE

Generalized RAKE. See rake receiver.

hand off

See handover.

handover

The act of transferring communication with user equipment from one base station to another. Sometimes referred to as *hand off*.

handover gain

The result of handover is a reduction of the log-normal fading margins compared to the single cell case. This reduction is referred to as handover gain.

hard handover

A handover that entails disconnection from the previous serving cell before establishing connection with the target cell. A hard handover is used in GSM systems or when transferring from a WCDMA system to a 2G system, or from one frequency to a different frequency within WCDMA.

HARQ

Hybrid ARQ

HCS

Hierarchical Cell Structure

HCS ranking

A method used to find the best server of a GSM mobile, taking HCS layer priority into account. used for slow-moving mobiles.

height AGL

Base station or mobile equipment antenna height above ground level.

HFS

Hopping Frequency Set. In GSM (2G) networks, a set of frequencies assigned to a channel group for planning with synthesizer hopping.

hopping gain

The effect of leveling out the fading and interference on different frequencies, achieved for a hopping connection (also called frequency diversity gain). The hopping gain increases with the number of frequencies in the hopping frequency set.

HR

Half Rate, relevant for speech coding in GSM and WCDMA networks

HS-DPCCH

High Speed Dedicated Physical Control Channel, used in HSDPA capable WCDMA networks.

HS-DSCH

High-Speed Downlink Shared Channel, used in HSDPA capable WCDMA networks.

HS-SCCH

High-Speed Shared Control Channel, used in HSDPA capable WCDMA networks.

HSCSD

High Speed Circuit Switched Data, used in GSM networks.

HSDPA

High-Speed Downlink Packet Access, capability in WCDMA networks.

HSPA

High Speed Packet Access (HSDPA plus EUL), capabilities in WCDMA networks.

HSUPA

High Speed Uplink Packet Access (same as EUL), capability in WCDMA networks.

HSN

Hopping Sequence Number, a value between 0 and 63, assigned to a frequency hopping channel group. For each value, a different hopping sequence is generated. Used in GSM networks.

ICDM

Inter Cell Dependency Matrix, represents the potential amount of interference from all GSM cells into all other GSM cells.

ICIC

Inter-Cell Interference Coordination

import project

Used in TEMS CellPlanner project settings as the library project containing equipment and templates shared across multiple projects.

interior area

The part of an LTE cell with geometry values above the geometry threshold. The interior area is usually close to the eNodeB (LTE RBS). See geometry.

K factor

Factor equal to the effective earth radius (km) / Earth radius (6370 km).

Kbps

Kilobit per second

L1

Layer 1, the lowest level of signaling on any interface, for example a radio interface.

LA

See Location Area.

LAC

Location Area Code

land use

See clutter.

link budget

The sum of gains and losses in a system that defines the maximum allowable pathloss from a subscriber to a base station. Parameters that affect the link budget include (among others) antenna gain, fading margins, transmit power, and receiver sensitivity.

LNF

Log normal fading.

Location Area

The group of cells within which a mobile is paged in case of an incoming CS call. The unique identity of a Location Area consists of PLMN ID + LAC.

Location Service Area

The Location Service Area defines the best server coverage area of a cell by means of a polygon with

15 corners. The coordinates of these corners are transferred to OSS-RC and stored in the UTRAN system for mobile terminal positioning services. The terminal position can be determined with a resolution of the cells' best server area. TEMS CellPlanner calculates the coordinates for the best server area polygons and provides this information as a cell specific configuration parameter.

LSA

See Location Service Area.
Note: According to 3GPP, LSA instead abbreviates Localised Service Area which is not used in TEMS CellPlanner.

LTE

Long Term Evolution, the mobile broadband standard succeeding 3G.

macro cell

Cell covered by a base station antenna placed above the roof-tops, usually with a cell radius of more than 1 km. Used in rural areas as well as urban environments.

max loss horizontally

Ericsson Urban propagation model parameter. Determines the maximal path loss to be calculated by the recursive microcell model.

MAIO

Mobile Allocation Index Offset. A frequency offset assigned to each frequency hopping TRX in a channel group, used to minimize the interference within sites with synchronized FH, applicable to GSM networks. Connections with the same HFS and HSN must have different MAIOs to avoid frequency collisions.

MAL

Mobile Allocation List, another term for Hopping Frequency Set used in TEMS CellPlanner. See HFS.

Managed Object

A software object in OSS-RC representing a network identity, such as Subnetwork, NodeBFunction, RncFunction, UtranCell and RbsLocalCell.

MBMS

Multimedia Broadcast Multicast Service, in WCDMA networks.

Mbps

Megabits per second

.MCC

Mobile Country Code. Part of the PLMN ID.

MCCH

MBMS Control Channel, used in WCDMA networks.

MCPA

Multiple Carrier Power Amplifier

MCS-n

The n:th Modulation and Coding Scheme, used with WiMAX, and EGPRS (n = 1 to 9).

MEIRP

Effective isotropic radiated power transmitted by a mobile to close the reverse link.

MET

Manually adjustable Electrical Tilt. Tilt range 0° - (first upper minima)°.

MICH

MBMS Notification Indicator Channel, used in WCDMA networks.

micro cell

Cell covered by a base station antenna placed in street level. A typical micro cell antenna height is 5 m, with a cell radius of 200-400 m.

MIMO

Multiple Input Multiple Output antenna technique used in LTE and WCDMA networks. Several Tx and Rx antennas are used to transfer different bit streams on the same frequency.

mini cell

A small macro cell, covered by a base station antenna placed at the same height as the roof-tops. Used in urban environments only. The cell radius is about 400-1000 m.

MME

Mobiliy Management Entity, used in real LTE sub-networks.

MNC

Mobile Network Code. Part of the PLMN ID.

MO

See Managed Object.

MRC

Maximum Ratio Combining, a diversity method used in LTE networks.

MRP

Multiple Re-use Pattern, a method for frequency planning of GSM networks.

MS

Mobile Station, the mobile terminal equipment for GSM, used by the subscriber transmitting in the uplink and receiving in the downlink. See UE.

MSC

Mobile Service Switching Center. Core Network node for CS services.

MTCH

MBMS point-to-multipoint Traffic Channel, used in WCDMA networks.

Multi-band cell

See Dual-band cell.

NCC

Network Color Code, in GSM networks.

neighbor cell

An adjacent cell that participates in a relationship, for handover purposes, with the serving cell.

neighbor list

A list of adjacent cells used for handover calculations. Radio prediction and topological consideration determine neighbor cells.

NodeB

WCDMA radio base station

noise figure improvement

The improved noise characteristics accomplished by using a tower mounted amplifier that reduces receiver noise.

noise rise

The more load in a WCDMA LTE network, the more interference will be generated. This increase is referred to as noise rise.

non-orthogonality factor

Despite orthogonal codes in WCDMA downlink, the DL channels cannot be perfectly separated due to multipath propagation. A fraction - the non-orthogonality factor - of the total power will be experienced as interference.

Okumura-Hata model

Empirical propagation model based on RF measurements in different areas.

NP

Nominal Prospect, models a terminal type using one LTE bearer.

OL

Overlaid. The sub- cell with smaller coverage and tighter frequency reuse in a pair of underlaid/ overlaid GSM sub-cells.

orthogonal part of interference

A WCDMA serving cell's contribution to DL interference, removable in the UE's receiver by means of orthogonality codes. Synonym to self-interference.

OSS-RC

Ericsson's Operation and Support System for GSM and WCDMA networks.

PA

Power Amplifier

paging

The act of seeking user equipment when a call is placed to that equipment.

paging channel

A DL channel used for transmission of control information and pages from a base station to a mobile station.

PBCCH

Packet BCCH, control channel dedicated for PS services in GSM networks.

PCH

Paging Channel. WCDMA downlink transport channel. Carries control information to the user equipment when the location is unknown.

PCI

Physical Cell ID used in LTE networks to distinguish cells from each other. See also CID.

PCIG

Physical Cell ID Group, identifies a group of PCIs in an LTE network. See also CID group.

P-CPICH

Primary Common Pilot Channel, also referred to as CPICH. WCDMA downlink physical channel. The phase and timing reference for all downlink channels.

PDCH

Packet Data Channel used in GSM networks.

PICH

Page Indication Channel. WCDMA downlink physical channel.

pico cells

Mainly indoor cells, with a radius typically of less than 50 meters.

pilot channel

An unmodulated, direct-sequence spread spectrum signal transmitted continuously by each WCDMA base station. The pilot channel allows user equipment to acquire the timing of the forward WCDMA channel, provides a phase reference for coherent demodulation. The pilot channel is used to compare signal strength between base stations for determining when to enter soft and softer handover state.

pilot strength

The received pilot power of a channel. Same as RSCP.

pixel

See bin.

PLMN

Public Land Mobile Network

plot

Color coded representation of analysis results, shown on the map display.

PLMN ID

Unique identifier of a PLMN. Consists of MCC + MNC.

prediction model

TEMS CellPlanner synonym to propagation prediction model (IEEE). See also propagation model.

project

A geographic area with associated data that defines its elevation, land use, land cover, roads and physical boundaries, demographics, traffic demand, and computed values. Information can be shared among projects by exporting a project imported into an overall project.

propagation model

TEMS CellPlanner synonym to propagation prediction model (IEEE). An algorithm for received RF signal strength calculation and prediction, such as Ericsson 9999 or Urban models. See also prediction model.

PS

Packet Switched. The connection type used for packet data services in GSM (GPRS, EGPRS) networks and WCDMA, and for all data services in WiMAX. May also carry WCDMA streaming data. See CS.

PSCH

Primary Synchronization Channel in WCDMA networks.

puncturing

In TEMS CellPlanner this term means replacing predicted value with measured value.

PUSC

Partial Usage of Sub-Carriers in WiMAX networks.

QAM

Quadrature Amplitude Modulation

QPSK

Quadrature Phase Shift Keying

R99

UMTS standard Release 1999

RA

See Routing Area.

RAC

Routing Area Code

RACH

Random Access Channel

radio link

The physical channel between a cell and a UE.

rake receiver

The receiver used in WCDMA systems. Radio waves travel via multiple paths from the sender's antenna to the receiver's antenna. The normal receivers in narrow-band GSM equipment are not able to resolve those different paths, so the performance of a GSM receiver might be drastically degraded in a strong multi-path fading environment.

random access

The initialization of a UE or MS originating call by signaling on RACH.

RANOS

Old name for the WCDMA part of OSS-RC.

RAT

Radio Access Technology, e.g. WCDMA.

RB

Resource Block, used in LTE networks. Consists of 12 sub-carriers with a total bandwidth of 180 kHz.

RBS

Radio Base Station, the base station in WCDMA and WiMAX networks. LTE as well as GSM base stations, by standard named eNodeB and (BTS respectively, are named RBS in TEMS CellPlanner.

receive (Rx) diversity gain

Gain in dB added to the received signal due to antenna diversity (spatial or polarization diversity).

receive (Rx) noise figure

The ratio (in dB) between the noise generated by the receiver and the ideal thermal noise level.

receiver sensitivity

The signal level required at the receiver input that just satisfies the required $E_b/(N_o+I_o)$ in GSM networks or E_b/I_o in WCDMA networks.

reference project

A project in TEMS CellPlanner based on data from OSS-RC used as a common reference for configuration status.

registration

The process by which user equipment signals its location and parameters to a base station.

repeater

Device that receives a radio signal and amplifies it for retransmission at the physical layer. Repeaters are used for coverage and/or capacity enhancements of a mobile network.

resolution distance

Ericsson Urban propagation model parameter. Inside the defined radius, the propagation model makes a pathloss prediction for every bin. Outside the defined radius, the propagation model is not calculating every bin and therefore interpolating the results. The larger the value, the longer the time required for making the pathloss predictions.

RET

Remotely adjustable Electrical Tilt. Valid only for UMTS.

reverse channel

An UL radio channel used to transport user and signaling traffic from a single mobile station to one or more base stations.

RF

Radio Frequency

RLC

Radio Link Control. A layer 2 protocol in radio networks.

RNC

Radio Network Controller in WCDMA systems.

RNS

Radio Network Subsystem. Consists of and RNC and associated RBSs.

Routing Area

The group of cells within which a mobile is paged in case of incoming PS data. Part of a Location Area. The unique identity of a Routing Area consists of PLMN ID + LAC + RAC.

RSCP

Received Signal Code Power, indicates the quality of a WCDMA pilot channel. Used to predict coverage.

RSSI

Received Signal Strength Indicator, indicates the quality of the carrier.

Rx

Receiver or reception.

SAE

System Architecture Evolution (the LTE network).

SON

Self-Organizing Network in LTE networks.

S-TDD

Synchronized Time-Division Duplex in WiMAX systems.

scrambling code

The long codes used in the WCDMA downlink to separate transmissions from different sources. One scrambling code should be assigned to each cell. The primary scrambling codes are limited to 512 to prevent the cell search procedure from becoming excessive. System operators can choose to further restrict the number of available codes.

SDCCH

Stand-alone Dedicated Control Channel, a logical channel used in GSM systems.

sector

In TEMS CellPlanner, a sector groups a set of WCDMA cells with a set of antenna branches, where the cells may transmit on different frequencies using the antenna branches.

self-interference

Same as orthogonal part of interference.

service

Type of mobile service, such as full-rate speech, HSCSD, GPRS, or EGPRS

Service Area

Consists of a number of cells and is used by the UTRAN to indicate the location of a UE to the Core Network.

serving cell

The cell handling an ongoing call. See best server.

SF

Spreading Factor

side lobe suppression

The relative attenuation from the first side lobe (above horizon) compared to the main lobe.

Single-band cell

An underlaid/overlaid cell pair where the overlaid sub-cell uses the same frequency band as its underlaid sub-cell.

SINR

Signal-to-Interference-plus-Noise Ratio. Same as C/(I+N).

SIR

Signal to Interference Ratio. Received signal code power (RSCP) divided by interfering signal code power (ISCP).

site

A site is a geographical location where RBSs and other physical equipment is placed.

SNR

Signal-to-Noise Ratio. The ratio of a signal power to the noise power corrupting the signal.

soft combining gain

The gain when the UE combines information from different cells.

soft handover

In WCDMA networks, a handover characterized by initiating communications with a cell on a new RBS on the same frequency before terminating communications with the old cell.

softer handover

In WCDMA networks, a handover between multiple cells in the same RBS. Signals received by different cells can all be directed to the same rake receiver in the base station and combined coherently so only one voice frame is advanced to the RNC. This type of handover permits greater efficiency in the use of handover, as only one channel element is required to support it.

soft-softer handover

A handover involving one cell on one RBS and multiple cells on another RBS on the same frequency.

spectrum efficiency

A comparative measurement that shows the extent to which a radio interface can support a given number of users of a given service. Spectrum efficiency can be measured in Equivalent Telephony Erlang per cell, per MHz, or Equivalent Telephony Erlang per square kilometer per MHz.

spreading factor

In WCDMA, a factor that determines the spreading code used for the channel. The range for each of the channels is 4 - 512. Valid values include 4, 8, 16, 32, 64, 128, 256, and 512. The lower the spreading factor, the larger the bandwidth and the fewer codes available for other users.

SSCH

Secondary Synchronization Channel in WCDMA systems.

sub-cell

A cell may consist of an overlaid sub-cell and an underlaid sub-cell that combine to form one cell. The overlaid and underlaid sub-cells may use different training sequence codes and output power.

subscriber

Active user in a radio network. From a planning perspective, the number of subscribers are the number of simultaneously active users.

sync channel

A downlink channel transporting synchronization messages to the user equipment.

synthesizer hopping

Every transceiver changes its transmission frequency for every timeslot in GSM transmission. The number of hopping frequencies is not limited to the number of transceivers.

system

A collection of network elements in a project: mobile telephone service that covers a geographic area such as a city, metropolitan region, county, or group of counties.

TA

Timing Advance in GSM networks, measured in units equal to one bit.

TCH

Traffic Channel in GSM. See also **DCH**.

TCP

Abbreviation of TEMS CellPlanner. (TCP is most known as the Internet protocol Transmission Control Protocol, but that definition is overridden in TEMS CellPlanner).

TDD

Time Division Duplex

TDMA

Time Division Multiple Access, frame structure used in GSM and similar technologies.

TEMS

The collective name for Ascom's family of applications for planning and optimization of mobile telecommunications networks.

terminal class

Terminal type characterized by its parameters. The same as mobile station class.

terminal category

Classification of UEs with certain capabilities for WCDMA HSPA networks.

HSDPA terminals are divided into 12 categories supporting different numbers of codes and different modulations (QPSK only, or both QPSK and 16 QAM)

EUL terminals are divided into 6 categories supporting different numbers of codes and different spreading factors

terminal type

Classifies a GSM terminal as slow or fast moving. Depending on the terminal type, HCS ranking or Basic ranking will be used.

TFRC

Transport Format and Resource Combination

through wall constant

Ericsson Urban propagation model parameter. The value for building penetration loss through the external wall. This parameter makes the assumption that the radio wave penetrates the wall at a right angle.

TI

TEMS Investigation

tilt

The main lobe of an antenna can be downtilted in different ways.

- FET - Fixed Electrical Tilt. Standard 0°, 2° and 6°.
- MET - Manually adjustable Electrical Tilt. Tilt range 0° - (First upper minima)°.
- RET - Remotely adjustable Electrical Tilt. Only valid for UMTS.
- Mechanical downtilt

TMA

Tower Mounted Amplifier connected to the antenna. Compensates for the loss in the receiving branch and improves the noise figure. Adds to the loss in the transmitting branch.

traffic capacity

Total traffic (Erlangs/cell and/or kbps/cell) that can be supported by a single cell, specified at a specific Grade of Service.

traffic case

A combination of a terminal type and a bearer.

traffic channel

A logical channel that carries user information, such as speech or data.

TFRC

Transport Format and Resource Combination in HSDPA capable WCDMA networks.

traffic demand

Defines the geographical distribution of offered traffic in a TEMS CellPlanner network plan.

TRX

Transceiver. The combination of transmitting and receiving equipment in a common housing used in radio base stations. Provides full-duplex operation.

TS

Time slot

TSA

Time Spread Allocation in LTE networks. Different sets of RBs are allocated to different terminals.

TSC

Training Sequence Code in GSM networks. The eight different training sequences transmitted by cells or sub-cells. Can be used to distinguish between cells with the same radio frequency.

TTI

Transmission Time Interval in WCDMA networks.

Tx

Transmitter or transmission.

UARFCN

UMTS Absolute Radio Frequency Channel Number in WCDMA.

UE

User Equipment. The mobile terminal equipment for 3rd Generation, used by the subscriber transmitting in the uplink and receiving in the downlink. See MS.

UMTS

Universal Mobile Telecommunications System, the same as 3rd generation mobile telephony system.

UL

Either of:

- Uplink: A reverse radio channel used to transport user and signaling traffic from a single mobile station to one or more base stations.
- Underlaid: A GSM sub-cell with larger coverage and less tight frequency reuse in a pair of underlaid/overlaid sub-cells. Usually carrying the BCCH.

Urban propagation model

A half-screen RF propagation model, accounting for prediction above building roof tops (vertical plane, between buildings (horizontal plane), plus a recursive microcell model, accounting for prediction.

user equipment

An end user radio equipment intended to be used in motion or at unspecified points.

UTM hemisphere

The Universal Transverse Mercator projection system has different parameter set-up depending

on the hemisphere (Northern Hemisphere or Southern Hemisphere).

UTM zone

The Universal Transverse Mercator projection system divides the Earth into 60 zones, each of which is 6 degrees longitude wide. The first zone is centered at 177 degrees West of Greenwich with zone numbers proceeding east.

UTRAN

UMTS Terrestrial Radio Access Network.

Walfisch-Ikegami model

Empirical model suitable for built-up areas.

WCDMA

Wideband Code Division Multiple Access, a 3rd generation mobile telephony system.

WiMAX

Worldwide Interoperability for Microwave Access, specified by IEEE 802.16d (2004) and IEEE 802.16e (2005).

XML

Extensible Markup Language.

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